50

SMITH

SYSTEMATIC PLANT STUDIES

ADVERTISEMENT

The United States National Herbarium, which was founded by the Smithsonian Institution, was transferred in the year 1868 to the Department of Agriculture and continued to be maintained by that department until July 1, 1896, when it was returned to the official custody of the Smithsonian Institution. The Department of Agriculture, however, continued to publish the series of botanical reports entitled "Contributions from the United States National Herbarium," which it had begun in the year 1890, until, on July 1, 1902, the National Museum, in pursuance of an act of Congress, assumed responsibility for the publication. The first seven volumes of the series were issued by the Department of Agriculture.

ALEXANDER WETMORE,
Assistant Secretary, Smithsonian Institution.

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

CONTRIBUTIONS

FROM THE

UNITED STATES NATIONAL HERBARIUM

VOLUME 22

SYSTEMATIC PLANT STUDIES CHIEFLY TROPICAL AMERICAN

HITCHCOCK, CHASE, PIPER, BLAKE
STANDLEY, and LEONARD

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PREFACE

Of the ten parts comprising volume 22 of the Contributions, the first consists of papers by A. S. Hitchcock, systematic agrostologist of the United States Department of Agriculture, and Agnes Chase, assistant agrostologist, presenting a revision of four of the smaller genera of the tribe Paniceae, in continuation of their studies upon North American grasses. The method of treatment is the same as that followed in an earlier paper entitled "The North American Species of Panicum" (published as volume 15 of the Contributions, 1910), of which Professor Hitchcock and Mrs. Chase were joint authors. The first two genera, *Ichnanthus* and *Lasiacis*, discussed by Professor Hitchcock, are tropical American, though one species of the former has been introduced into the Philippine Islands, and one species of the latter extends into southern Florida. Of the other two genera, revised by Mrs. Chase, *Brachiaria* is found in the warmer parts of both hemispheres and in America extends into the southern United States; and *Cenchrus*, whose species are known commonly as sandburs, is widely distributed in the warm and temperate regions of both hemispheres, some of the species being troublesome weeds.

In part 2 Prof. Charles V. Piper, of the Bureau of Plant Industry, United States Department of Agriculture, presents the results of a critical study of *Allocarya*, a genus of boraginaceous plants, natives chiefly of the western United States. From this territory 35 species have hitherto been described, two-thirds of these having been proposed by the late Edward L. Greene, who himself established the genus. The number is increased in the present paper to 79. The classification adopted is founded chiefly upon the diversity of sculpture and armature of the mature nutlets, these characters, though almost microscopic, being regarded as constant and diagnostic for the species, which in several of the groups are not distinguishable by evident superficial characters.

Part 3 consists of four papers by Prof. A. S. Hitchcock, revising four additional genera of grasses of the tribe Paniceae. The first two, *Isachne* and *Oplismenus*, are chiefly tropical, although one species of *Oplismenus* extends into the southern United States. The other two genera are widely distributed in tropical and temperate regions. The genus *Echinochloa* includes the cosmopolitan weed *E. crusgalli*, one form of which is cultivated in India for food and occasionally in the United States for forage. The genus *Chaetochloa* includes the common millet, of which there are many varieties, cultivated in the Old World as a grain and in the United States for forage.

The fourth part, by Mrs. Agnes Chase, is a revision of *Pennisetum*. This is one of the important genera of grasses and belongs chiefly to the Old World, Africa being especially rich in number of species. In North America we have 10 species which are native and 4, including the well-known pearl millet, which are now established from earlier introductions, besides a few species cultivated for ornament, and one promising forage grass which is now being introduced into the Southern States. The native North American species have been much confused with each other and with closely related South American species. They are confined chiefly to the Tropics and subtropics, only one native species extending into the southern United States.

Part 5, by Paul C. Standley, Assistant Curator of the National Herbarium, is entitled "Flora of Glacier National Park, Montana." It is based largely upon personal exploration by the writer, and has been written for the purpose of enabling visitors to this park to become more familiar with its wild plants and to derive greater enjoyment from them. Among the many thousands of persons who visit the national parks each year a large number are interested in the plant life, including not only the wealth of conspicuous flowering plants but the trees of the forest also. All the national parks offer exceptional opportunity for the study and enjoyment of primeval vegetation, and in this respect none of them perhaps is superior to Glacier National Park. This publication will prove useful, moreover, not only in Glacier Park, but elsewhere in the mountains of Idaho, Alberta, and British Columbia. It should be helpful also to travelers in Yellowstone National Park, since most of the common plants of that region occur in Glacier Park.

In part 6 Prof. A. S. Hitchcock publishes an account of the grasses of British Guiana. It contains a descriptive list of the species, keys to the tribes and genera, a discussion of the distribution of the species according to habitat, and notes on their economic uses; 10 new species are described, and all but 1 illustrated. The flora is related on the one hand to that of Brazil and on the other to that of the West Indies. A few montane species are found in the region of the famous table mountain, Roraima, but in the main the species are those of the tropical lowlands. The savanna grasses of the southern part of the colony furnish the basis of an important stock industry.

In part 7 Professor Hitchcock presents a revision of *Aristida*, one of the larger genera of North American grasses. The species of *Aristida*, or needle grasses, are found throughout the temperate and tropical regions of the world in grassy plains and hills, and are often the dominant species of prairies, steppes, deserts, and arid or semiarid lands generally. They are also frequent in the pine barrens of

the coastal plain of the United States. In the early stages of their growth they form a significant part of the forage in regions where they grow, but when they mature they become hard and wiry. On the grazing areas where needle grasses are common, the sharp-pointed fruits are troublesome to stock, because they often penetrate the skin and sometimes also the eyes and nostrils. The genus itself is easily identified by the hard, cylindrical, three-awned, sharp-pointed fruits, but the species are closely allied and often can be distinguished only with difficulty. There are 60 species in North America, 7 of which are here described as new.

Part 8, by Dr. S. F. Blake, of the Bureau of Plant Industry, United States Department of Agriculture, contains descriptions of 1 new genus and 118 new species of American Asteraceae. With few exceptions, the new plants here described are from Mexico and Central and South America.

Part 9, by Prof. Charles V. Piper, is devoted to a study of certain groups of the tribe Phaseolineae of the family Fabaceae. A key is given to the American genera, several of which have been described as new within recent years. Two genera, *Alepidocalyx* and *Condylostylis*, are described for the first time in the present paper. Keys are given to the species of some of the smaller genera and to the members of some of the sections of *Phaseolus*. The last genus is of great economic importance because it contains the common and lima beans, besides several other species whose seeds are articles of human food. Many of the species of *Phaseolus* have been imperfectly understood, and it is highly desirable that in so important a genus the relationship of the species should be determined definitely. The difficulty of such a study is greatly increased by the unusual variation in foliage characters exhibited by many species of *Phaseolus*.

The tenth and concluding part, by Emery C. Leonard, aide in the National Herbarium, consists of an account of the North American species of *Scutellaria*, or skullcap. This group of the Mint Family is generally distributed in temperate and tropical America, and also in the Old World. No full account of the North American species has appeared since Bentham's monograph of the Labiatae in De Candolle's Prodromus in 1848. Later exploration has increased greatly the number of known North American species. In the present revision no new species have been found from the United States, but much study has been necessary in order to treat satisfactorily the numerous older names, especially because of the inconstancy that seems to prevail in the characters of these species. Recent explorations in little-known parts of the tropical region of North America have produced material from which several new species are here described.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

CONTENTS

	Page
THE NORTH AMERICAN SPECIES OF ICHNANTHUS. By A. S. Hitchcock	1
Introduction	1
Description of the genus and species	1
Doubtful or excluded species	12
THE NORTH AMERICAN SPECIES OF LASIACIS. By A. S. Hitchcock	13
Introduction	13
Description of the genus and species	13
Doubtful species	31
THE NORTH AMERICAN SPECIES OF BRACHIARIA. By Agnes Chase	33
Introduction	33
History of the genus	33
Description of the genus and species	35
Excluded species	43
THE NORTH AMERICAN SPECIES OF CENCHRUS. By Agnes Chase	45
Introduction	45
Terminology	46
History of the genus	47
Description of the genus and species	50
Doubtful species	76
Excluded species	77
A STUDY OF ALLOCARYA. By Charles V. Piper	79
Introduction	79
Systematic treatment	81
THE NORTH AMERICAN SPECIES OF ISACHNE. By A. S. Hitchcock	115
Introduction	115
Description of the genus and species	115
THE NORTH AMERICAN SPECIES OF OPLISMENUS. By A. S. Hitchcock	123
Introduction	123
Description of the genus and species	123
Doubtful species	132
THE NORTH AMERICAN SPECIES OF ECHINOCHLOA. By A. S. Hitchcock	133
Introduction	133
Description of the genus and species	133
Doubtful species	153
THE NORTH AMERICAN SPECIES OF CHAETOCHLOA. By A. S. Hitchcock	155
Introduction	155
Description of the genus and species	156
Doubtful species	208
THE NORTH AMERICAN SPECIES OF PENNISETUM. By Agnes Chase	209
Introduction	209
Description of the genus and species	210
Excluded species	234
FLORA OF GLACIER NATIONAL PARK, MONTANA. By Paul C. Standley	235
Introduction	235
General features of the flora	236
Life zones	238
Transition Zone	239
Canadian Zone	241
Hudsonian Zone	245
Arctic-Alpine Zone	247
Scope and plan of the flora	249
Earlier botanical exploration	251
Acknowledgments	253

FLORA OF GLACIER NATIONAL PARK, MONTANA. By Paul C. Standley—Continued. Page
Bibliography ... 253
Systematic treatment ... 255
Key to the families ... 255
Annotated catalogue of species ... 263
GRASSES OF BRITISH GUIANA. By A. S. Hitchcock ... 439
Introduction ... 439
Descriptive list, with keys ... 447
List of new species and new names ... 515
THE NORTH AMERICAN SPECIES OF ARISTIDA. By A. S. Hitchcock ... 517
Introduction ... 517
Description of the genus and species ... 518
Doubtful species ... 585
List of new species and new names ... 586
Excluded species ... 586
NEW AMERICAN ASTERACEAE. By S. F. Blake ... 587
Introduction ... 587
Vernonieae ... 587
Eupatorieae ... 587
Astereae ... 591
Inuleae ... 596
Heliantheae ... 596
Helenieae ... 648
Senecioneae ... 651
Mutisieae ... 651
Cichorieae ... 655
STUDIES IN AMERICAN PHASEOLINEAE. By Charles V. Piper ... 663
Introduction ... 663
Key to American genera of Phaseolineae ... 664
Monoplegma ... 664
Vigna ... 665
Condylostylis ... 667
Strophostyles ... 668
Ramirezella ... 669
Minkelersia ... 670
Alepidocalyx ... 672
Phaseolus ... 673
Section Sigmoidotropis ... 674
Section Cochliasanthus ... 677
Section Lasiospron ... 677
Section Microcochle ... 679
Section Macroptilium ... 680
Section Ceratotropis ... 682
Phaseolus coccineus and its allies ... 683
Phaseolus angustissimus, *P. filiformis*, and *P. wrightii* ... 687
Phaseolus metcalfei and its close relatives ... 687
Phaseolus pedicellatus and its allies ... 688
Phaseolus micranthus, *P. brevicalyx*, and *P. opacus* ... 695
Miscellaneous species, section Euphaseolus ... 696
THE NORTH AMERICAN SPECIES OF SCUTELLARIA. By Emery C. Leonard ... 703
Introduction ... 703
Systematic treatment ... 705
Doubtful species ... 747
INDEX ... 749

ILLUSTRATIONS

PLATES

		Facing page
PLATE 1.	*Ichnanthus mayarensis* (Wright) Hitchc	12
2.	*Ichnanthus tenuis* (Presl) Hitchc. & Chase	12
3.	*Ichnanthus nemorosus* (Swartz) Doell	12
4.	*Ichnanthus pallens* (Swartz) Munro	12
5.	*Ichnanthus axillaris* (Nees) Hitchc. & Chase	12
6.	*Ichnanthus lanceolatus* Scribn. & Smith	12
7.	*Ichnanthus nemoralis* (Schrad.) Hitchc. & Chase	12
8.	*Ichnanthus mexicanus* Fourn	12
9.	*Ichnanthus ichnodes* (Griseb.) Hitchc. & Chase	12
10.	*Lasiacis procerrima* (Hack.) Hitchc	32
11.	*Lasiacis rugelii* (Griseb.) Hitchc	32
12.	*Lasiacis grisebachii* (Nash) Hitchc	32
13.	*Lasiacis oaxacensis* (Steud.) Hitchc	32
14.	*Lasiacis ligulata* Hitchc. & Chase	32
15.	*Lasiacis rhizophora* (Fourn.) Hitchc	32
16.	*Lasiacis leptostachya* Hitchc	32
17.	*Lasiacis harrisii* Nash	32
18.	*Lasiacis divaricata* (L.) Hitchc	32
19.	*Lasiacis globosa* Hitchc	32
20.	*Lasiacis sloanei* (Griseb.) Hitchc	32
21.	*Lasiacis patentiflora* Hitchc. & Chase	32
22.	*Lasiacis sorghoidea* (Desv.) Hitchc. & Chase	32
23.	*Lasiacis ruscifolia* (H. B. K.) Hitchc	32
24.	*Lasiacis anomala* Hitchc	32
25.	*Isachne polygonoides* (Lam.) Doell	122
26.	*Isachne leersioides* Griseb	122
27.	*Isachne pygmaea* Griseb	122
28.	*Isachne rigidifolia* (Poir.) Urban	122
29.	*Isachne rigens* (Swartz) Trin	122
30.	*Isachne angustifolia* Nash	122
31.	*Isachne arundinacea* (Swartz) Griseb	122
32.	*Isachne disperma* (Lam.) Doell	122
33.	View south from the Garden Wall, showing the mountains of the west slope	438
34.	View southeast from Iceberg Lake	438
35.	Swiftcurrent Valley	438
36.	Pond near Swiftcurrent Creek below Lake McDermott	438
37.	View from a point near Granite Park; Heavens Peak at the right	438
38.	A. Limber pine (*Pinus flexilis*) on Altyn Peak. B. Dense forest of hemlock and giant cedar near Lake McDonald	438
39.	Mountain side below Sperry Chalets	438
40.	A. Shore of Lake McDonald. B. Sphagnum bog at Johns Lake	438
41.	View on the trail to Piegan Pass	438

Facing page

PLATE 42. A. Dwarfed trees at Swiftcurrent Pass. B. Meadow near Granite Park ---- 438
43. Ptarmigan Lake ---- 438
44. A. Lake Ellen Wilson and Gunsight Pass. B. An Arctic-Alpine rock slide ---- 438
45. A. Fir clubmoss (*Lycopodium selago*). B. Stiff clubmoss (*Lycopodium annotinum*) ---- 438
46. A. Running-pine (*Lycopodium clavatum*). B. Queencup (*Clintonia uniflora*) ---- 438
47. A. Western yew (*Taxus brevifolia*). B. Ladies'-tresses (*Ibidium romanzoffianum*) ---- 438
48. A. Purple clematis (*Clematis columbiana*). B. White dryad (*Dryas octopetala*) ---- 438
49. A. Alpine bistort (*Polygonum viviparum*). B. Spiny currant (*Ribes lacustre*) ---- 438
50. A. Red raspberry (*Rubus strigosus*). B. Blue phacelia (*Phacelia lyallii*) ---- 438
51. A. Canada buffaloberry (*Lepargyrea canadensis*). B. Cow parsnip (*Heracleum lanatum*) ---- 438
52. A. Rough aster (*Aster conspicuus*). B. Showy fleabane (*Erigeron salsuginosus*) ---- 438
53. Map of British Guiana ---- 439
54. *Stevia tephrophylla* Blake ---- 662
55. *Gutierrezia grandis* Blake ---- 662
56. *Erigeron maxonii* Blake ---- 662
57. *Achyrocline crassiceps* Blake ---- 662
58. *Parthenium densipilum* Blake ---- 662
59. *Flourensia hirtissima* Blake ---- 662
60. *Verbesina baccharidea* Blake ---- 662
61. *Calea ovalis* Blake ---- 662
62. *Trichocoryne connata* Blake ---- 662
63. *Proustia cuneata* Blake ---- 662
64. *Condylostylis venusta* ---- 668

TEXT FIGURES

Page

FIGURE 1. *Brachiaria erucaeformis* ---- 37
2. *Brachiaria ophryodes* ---- 38
3. *Brachiaria ciliatissima* ---- 39
4. *Brachiaria meziana* ---- 40
5. *Brachiaria platyphylla* ---- 41
6. *Brachiaria plantaginea* ---- 42
7. *Cenchrus myosuroides* ---- 52
8. *Cenchrus catharticus* ---- 54
9. *Cenchrus distichophyllus* ---- 55
10. *Cenchrus pilosus* ---- 56
11. *Cenchrus viridis* ---- 57
12. *Cenchrus echinatus* ---- 59
13. *Cenchrus insularis* ---- 63
14. *Cenchrus gracillimus* ---- 64
15. *Cenchrus incertus* ---- 65
16. *Cenchrus microcephalus* ---- 67
17. *Cenchrus pauciflorus* ---- 68
18. *Cenchrus pauciflorus* ---- 69

		Page
FIGURE 19.	*Cenchrus tribuloides*	73
20.	*Cenchrus palmeri*	75
21.	*Oplismenus burmanni*	125
22.	*Oplismenus setarius*	128
23.	*Oplismenus hirtellus*	130
24.	*Oplismenus rariflorus*	132
25.	*Echinochloa pyramidalis*	134
26.	*Echinochloa polystachya*	135
27.	*Echinochloa oplismenoides*	136
28.	*Echinochloa holciformis*	137
29.	*Echinochloa walteri*	138
30.	*Echinochloa crusgalli*	141
31.	*Echinochloa crusgalli mitis*	145
32.	*Echinochloa crusgalli edulis*	146
33.	*Echinochloa crusgalli zelayensis*	147
34.	*Echinochloa crusgalli crus-pavonis*	149
35.	*Echinochloa colonum*	151
36.	*Chaetochloa barbata*	159
37.	*Chaetochloa poiretiana*	160
38.	*Chaetochloa palmifolia*	162
39.	*Chaetochloa sulcata*	164
40.	*Chaetochloa lutescens*	167
41.	*Chaetochloa geniculata*	172
42.	*Chaetochloa tenax*	177
43.	*Chaetochloa verticillata*	179
44.	*Chaetochloa scandens*	181
45.	*Chaetochloa tenacissima*	182
46.	*Chaetochloa grisebachii*	184
47.	*Chaetochloa magna*	185
48.	*Chaetochloa viridis*	187
49.	*Chaetochloa italica*	190
50.	*Chaetochloa longipila*	191
51.	*Chaetochloa corrugata*	192
52.	*Chaetochloa liebmanni*	193
53.	*Chaetochloa latifolia*	195
54.	*Chaetochloa macrosperma*	196
55.	*Chaetochloa villosissima*	197
56.	*Chaetochloa setosa*	199
57.	*Chaetochloa setosa*	199
58.	*Chaetochloa rariflora*	201
59.	*Chaetochloa vulpiseta*	202
60.	*Chaetochloa macrostachya*	204
61.	*Chaetochloa macrostachya*	205
62.	*Chaetochloa scheelei*	208
63.	*Pennisetum villosum*	213
64.	*Pennisetum orientale triflorum*	215
65.	*Pennisetum ciliare*	215
66.	*Pennisetum glaucum*	217
67.	*Pennisetum karwinskyi*	220
68.	*Pennisetum setosum*	223
69.	*Pennisetum antillarum*	225
70.	*Pennisetum crinitum*	226
71.	*Pennisetum complanatum*	227
72.	*Pennisetum domingense*	228

		Page
FIGURE 73.	*Pennisetum durum*	229
74.	*Pennisetum distachyum*	230
75.	*Pennisetum prolificum*	231
76.	*Pennisetum bambusiforme*	233
77.	Northern part of British Guiana	440
78.	*Eragrostis guianensis*	455
79.	*Syntherisma malacophylla*	467
80.	*Axonopus stragulus*	473
81.	*Paspalum abrahami*	481
82.	*Panicum luticola*	486
83.	*Panicum guianense*	488
84.	*Panicum magnum*	490
85.	*Panicum errabundum*	495
86.	*Manisuris guianensis*	511
87.	Details of *Trichocoryne connata*	649

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UNITED STATES NATIONAL HERBARIUM

VOLUME 22, PART 1

REVISIONS OF NORTH AMERICAN GRASSES

By A. S. HITCHCOCK and AGNES CHASE

WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

PREFACE.

In the accompanying papers A. S. Hitchcock, systematic agrostologist of the United States Department of Agriculture, and Agnes Chase, assistant agrostologist, have continued the record of their studies upon North American grasses, presenting a revision of four of the smaller genera of the tribe Paniceae. The method of treatment is the same as that followed in an earlier paper entitled The North American Species of Panicum (published as volume 15 of the Contributions, 1910), of which Prof. Hitchcock and Mrs. Chase were joint authors.

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Curator of the United States National Herbarium.

CONTENTS.

	Page.
THE NORTH AMERICAN SPECIES OF ICHNANTHUS. By A. S. Hitchcock	1
Introduction	1
Description of the genus and species	1
Doubtful or excluded species	12
THE NORTH AMERICAN SPECIES OF LASIACIS. By A. S. Hitchcock	13
Introduction	13
Description of the genus and species	13
Doubtful species	31
THE NORTH AMERICAN SPECIES OF BRACHIARIA. By Agnes Chase	33
Introduction	33
History of the genus	33
Description of the genus and species	35
Excluded species	43
THE NORTH AMERICAN SPECIES OF CENCHRUS. By Agnes Chase	45
Introduction	45
Terminology	46
History of the genus	47
Description of the genus and species	50
Doubtful species	76
Excluded species	77
INDEX	IX

ILLUSTRATIONS.

PLATES.

Facing page.

PLATE 1. *Ichnanthus mayarensis* (Wright) Hitchc. 12
2. *Ichnanthus tenuis* (Presl) Hitchc. & Chase 12
3. *Ichnanthus nemorosus* (Swartz) Doell 12
4. *Ichnanthus pallens* (Swartz) Munro 12
5. *Ichnanthus axillaris* (Nees) Hitchc. & Chase 12
6. *Ichnanthus lanceolatus* Scribn. & Smith 12
7. *Ichnanthus nemoralis* (Schrad.) Hitchc. & Chase 12
8. *Ichnanthus mexicanus* Fourn 12
9. *Ichnanthus ichnodes* (Griseb.) Hitchc. & Chase 12
10. *Lasiacis procerrima* (Hack.) Hitchc 32
11. *Lasiacis rugelii* (Griseb.) Hitchc 32
12. *Lasiacis grisebachii* (Nash) Hitchc 32
13. *Lasiacis oaxacensis* (Steud.) Hitchc 32
14. *Lasiacis ligulata* Hitchc. & Chase 32
15. *Lasiacis rhizophora* (Fourn.) Hitchc 32
16. *Lasiacis leptostachya* Hitchc 32
17. *Lasiacis harrisii* Nash 32
18. *Lasiacis divaricata* (L.) Hitchc 32
19. *Lasiacis globosa* Hitchc 32
20. *Lasiacis sloanei* (Griseb.) Hitchc 32
21. *Lasiacis patentiflora* Hitchc. & Chase 32
22. *Lasiacis sorghoidea* (Desv.) Hitchc. & Chase 32
23. *Lasiacis ruscifolia* (H. B. K.) Hitchc 32
24. *Lasiacis anomala* Hitchc 32

TEXT FIGURES.

Page.

FIGURE 1. *Brachiaria erucaeformis* 37
2. *Brachiaria ophryodes* 38
3. *Brachiaria ciliatissima* 39
4. *Brachiaria meziana* 40
5. *Brachiaria platyphylla* 41
6. *Brachiaria plantaginea* 42
7. *Cenchrus myosuroides* 52
8. *Cenchrus catharticus* 54
9. *Cenchrus distichophyllus* 55
10. *Cenchrus pilosus* 56
11. *Cenchrus viridis* 57
12. *Cenchrus echinatus* 59
13. *Cenchrus insularis* 63
14. *Cenchrus gracillimus* 64
15. *Cenchrus incertus* 65
16. *Cenchrus microcephalus* 67
17. *Cenchrus pauciflorus* 68
18. *Cenchrus pauciflorus* 69
19. *Cenchrus tribuloides* 73
20. *Cenchrus palmeri* 75

THE NORTH AMERICAN SPECIES OF ICHNANTHUS.

By A. S. Hitchcock.

INTRODUCTION.

The genus *Ichnanthus* is closely allied to *Panicum*, the largest genus of the tribe Paniceae. The technical character that separates it is the presence of two winglike appendages at the base of the fertile lemma. In many of our North American species the appendages are obsolete and are indicated only by minute scars or excavations. Along with this technical character is that of a general resemblance in habit and in the appearance of the panicles and spikelets, especially the slightly boat-shaped tips of the glumes and lemmas. Most of the species have broad flat blades. One species, *I. ichnodes*, deviates from this concept in every respect except in the presence of well-marked appendages. Altogether the genus is an assemblage of somewhat diverse species, which are segregated from *Panicum* on rather weak technical grounds. The type species, with its large blades and prominent appendages, was more distinct from *Panicum* than most of the species that have since been united with it. As a genus *Ichnanthus* is less distinct than several groups, such as *Syntherisma*, *Lasiacis*, and *Echinochloa*, that were included by older authors in *Panicum* as sections.

There are about 25 known species of *Ichnanthus*, mostly South American, 10 extending into tropical North America and one, *I. pallens*, found also in the Philippines and tropical Asia.

DESCRIPTION OF THE GENUS AND SPECIES.

ICHNANTHUS Beauv.

Ichnanthus Beauv. Ess. Agrost. 56. 1812. Beauvois gives a generic description and mentions one species, *I. panicoides*, sent to him by Desfontaines from tropical America. This species, which has large appendages, is figured by Beauvois (*pl. 12. f. 1*).[1] Beauvois misunderstood the structure of the spikelet. He describes it as 3-flowered and calls attention to the unusual position of the intermediate floret, which, he says, consists of two paleae opposite and placed crosswise to the rest of the spikelet. He mistook the large appendages to the fertile lemma for an intermediate floret. The intermediate floret shown in his plate evidently represents the two appendages of the fertile lemma.

Naviculariа Raddi, Agrost. Bras. 38. *pl. 1. f. 5*. 1823. Three species are described, *N. hirta*, *N. glabra*, and *N. lanata*. The third species, being the one figured, is taken as the type. In this the appendages are one-third as long as the fertile lemma. The usual reference to *Naviculariа* is Bertol. Opus. Sci. Bologn. **3**: 408. 1819, but this is an error; the name does not appear there. The name Bertoloni gives is *Panicum loliaceum;* this Raddi cites under *Naviculariа hirta*.

[1] For a history of the genus see Chase, Proc. Biol. Soc. Washington **24**: 142–144. 1911.

DESCRIPTION.

Perennials or sometimes apparently annuals with erect or creeping culms and flat, usually broad, sometimes petioled leaf blades. Inflorescence paniculate, the open or contracted panicles terminal and axillary, the spikelets usually in pairs, unequally short-pediceled along the stiffly spreading or ascending main branches, or rarely single in an open panicle. Spikelets with keeled glumes, thus appearing somewhat laterally compressed, similar in structure to those of *Panicum*, the glumes and sterile lemma usually rather strongly nerved, and commonly ending in an apiculation or convolute point. First glume usually more than half as long as the spikelet, clasping, 3-nerved, the second glume and sterile lemma about equal, longer than the fruit, 5-nerved, the lemma inclosing a membranaceous palea and rarely a staminate flower; fertile lemma usually acute or acutish, indurate, dorsally compressed, usually raised on a short stipe, the margins usually flat but in our species more or less inrolled, the base bearing on either side membranaceous appendages adnate to the lemma below, free above, the appendages in many of our species obsolete and indicated only by minute scars or excavations; palea entirely inclosed in the margins of the lemma.

Abnormal specimens occur, especially in nos. 2 to 4, in which the sterile lemmas are greatly multiplied, forming elongate curved spikelets, as much as 2 cm. long.

KEY TO THE SPECIES.

Appendages of fertile lemma well-developed wings.
- Blades widest near the cordate base . . . . . 9. I. mexicanus.
- Blades narrowed toward the base, this not cordate.
  - Sheaths densely long-villous . . . . . 8. I. leiocarpus.
  - Sheaths glabrate or somewhat pilose.
    - Blades lanceolate-linear, many times longer than wide; spikelets long-pediceled . . . . . 10. I. ichnodes.
    - Blades lanceolate-elliptic, not more than 6 times longer than wide. 7. I. nemoralis.

Appendages of fertile lemma reduced to scars.
- Blades petiolate, the petiole 1 to 15 mm. long; first glume acute, about half as long as the spikelet.
  - Spikelets 3 mm. long; culms delicate, spreading, much branched; blades not over 6 mm. wide . . . . . 1. I. mayarensis.
  - Spikelets 3.5 to 4 mm. long; culms erect, simple or sparingly branched; blades 1 to 3 cm. wide. . . . . 6. I. lanceolatus.
- Blades more or less clasping, often oblique at base, usually over 1 cm. wide.
  - Glumes with attenuate tips, usually exceeding the sterile lemma and floret; blades thin, more or less pilose.
    - Spikelets with a few long stiff hairs near the margin toward the summit of both glumes; plants delicate; blades rarely over 4 cm. long and 1 cm. wide. . . . . 2. I. tenuis.
    - Spikelets glabrous or scabrous on the midnerves only; blades up to 7 cm. long and 2 cm. wide. . . . . 3. I. nemorosus.
  - Glumes acute or acuminate but not attenuate, the first shorter than the spikelet; blades firmer.
    - Blades lanceolate, 1 to 2 cm. wide, glabrous. . . . . 4. I. pallens.
    - Blades oval to ovate-lanceolate, 1.5 to 3.5 cm. wide, often pubescent beneath . . . . . 5. I. axillaris.

1. Ichnanthus mayarensis (Wright) Hitchc.

Panicum mayarense Wright, Anal. Acad. Cienc. Habana **8**: 296. 1871. "Mayarí Abajo," Cuba. The type specimen in the Gray Herbarium (*Wright* 3468) consists of several culms with decumbent bases, sessile or nearly sessile blades 2 to 3 mm. wide, and a panicle one-fourth the entire height of the plant.

Ichnanthus mayarensis Hitchc. Contr. U. S. Nat. Herb. **12**: 229. 1909. Based on *Panicum mayarense* Wright.

Ichnanthus wrightii Hitchc. Contr. U. S. Nat. Herb. **12**: 229. 1909. "Wright's 3880. U. S. National Herbarium no. 559959 of this collection is the type." This was collected at Río Seco in Arroyo Hondo, Pinar del Río, Cuba. The specimen consists of several delicate sterile culms rooting at the nodes, the thin blades as much as 1 cm. wide with petioles as much as 12 mm. long, and of a few culms, lacking the base, bearing small panicles. The plants appear to have grown in the shade.

DESCRIPTION.

Culms slender, wiry, straggling or spreading, rooting at the lower nodes, 20 to 40 cm. long, glabrous or the lower part minutely pubescent, striate, the nodes several; sheaths shorter (often much shorter) than the internodes, striate, glabrous or sparsely papillose-hispid on the surface, puberulent on the margin, especially toward the apex; blades lanceolate to narrowly elliptic, 2 to 5 cm. long, 3 to 6 mm. wide (or exceptionally as much as 1 cm. wide), striate, glabrous throughout or scaberulous above, abruptly narrowed at base into a petiole 1 to 5 mm. long, or on the sterile shoots as much as 15 mm. long; panicles 2 to 10 cm. long, usually long-exserted, the few main branches as much as 3 cm. long, rather stiffly spreading, the primary and secondary axes glabrous or scaberulous; spikelets about 3 mm. long, lanceolate, nearly terete, acute, glabrous, the unequal pedicels 0.5 to 2 mm. long; first glume 1.5 mm. long, broad and clasping at base, acute; second glume and sterile lemma equal, 3 mm. long, acuminate, strongly nerved, the sterile palea narrow, about 1 mm. long; fertile lemma 2 mm. long, acute, only slightly compressed dorsally, the margins inrolled, nearly or quite meeting, the scars at base about 0.5 mm. long, the stipe obsolete.

At the time *Ichnanthus wrightii* was described there were no specimens at hand except those collected by Wright. The specimens received since then show that the two forms must be united under one species.

DISTRIBUTION.

Dry pine woods and palm barrens, Cuba.

CUBA: Mayarí, *Wright* 3468. Arroyo Hondo, *Wright* 3880. Woodfred, *Shafer* 2966, 3058. Campo Florido, *León* 3450, 4143. Madruga, *León* 6373.

EXPLANATION OF PLATE 1.—*Ichnanthus mayarensis*. Specimen from Campo Florido, Cuba, *León* 4143 (U. S. Nat. Herb. no. 946900). Natural size.

2. Ichnanthus tenuis (Presl) Hitchc. & Chase.

Oplismenus tenuis Presl, Rel. Haenk. **1**: 319. 1830. "Hab. in Meixico, Panama." A duplicate type has been examined at the herbarium of the Petrograd Botanical Garden.

Panicum exile Steud. Syn. Pl. Glum. **2**: 45. 1854. Based upon *Oplismenus tenuis* Presl, the name changed probably because of *Panicum tenue* Roxb.

Panicum alsinoides Griseb. Fl. Brit. W. Ind. 550. 1864. "Hab. Jamaica!, *March;* St. Kitts!; Trinidad! *Pd.*" The description applies to *Ichnanthus tenuis*, but the specimen (sterile) in the Gray Herbarium collected in Jamaica by March is *Oplismenus setarius*. *Ichnanthus tenuis* is not known from Jamaica. The specimen of *P. alsinoides* in the Grisebach Herbarium from St. Kitts is also sterile and is probably not *Ichnanthus tenuis*.

Ichnanthus alsinoides Munro; Hemsl. Biol. Centr. Amer. Bot. **3**: 500. 1885. Based on *Panicum alsinoides* Griseb.

Ichnanthus tenuis Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 334. 1917. Based on *Oplismenus tenuis* Presl.

DESCRIPTION.

Apparently annual; culms slender, spreading or creeping, rooting at the nodes, much branched, the fertile shoots ascending, 10 to 20 cm. high, glabrous or puberulent mostly in lines, purplish; sheaths shorter than the internodes, papillose-hispid with weak hairs; blades lanceolate, 2 to 5 cm. long, 4 to 10 mm. wide, sessile, rounded or slightly cordate at base, acute or acuminate, thin, glabrous or puberulent, often sparsely hispid, the margins scabrous; panicles terminal and axillary, 2 to 4 cm. long, or the axillary ones smaller, mostly on long slender peduncles, the few branches rather weakly spreading, as much as 2 cm. long, the axes slender, angled, scaberulous, and sometimes puberulent, often villous or with a few long hairs at the base of the branches; spikelets narrowly lanceolate, 3 mm. long, acuminate, hispid, the pedicels slender, unequal, the shorter one of the pair 1 mm. long or less, the other twice or thrice as long; first glume broad and clasping at base, nearly as long as the spikelet, attenuate into a slender point, glabrous or scaberulous; second glume and sterile lemma nearly equal, acuminate, the former attenuate-pointed, prominently nerved, sparsely hispid along the lateral nerves, the sterile palea small and narrow; fertile lemma 1.5 to 2 mm. long, dorsally compressed, oblong, rounded at the apex, the margins flat, widely separated, the scar about 0.3 mm. long, extending downward into a wing decurrent on the short stipe.

DISTRIBUTION.

Damp shady places, Guatemala to northern South America.

GUATEMALA: Cubilquitz, *Türckheim* 8799 (abnormal). Cobán, *Türckheim* 908 (abnormal).

COSTA RICA: Alajuela, *Jiménez* 164, 165, 701, 705. Boruca, *Tonduz* 3363, 4460. Buenos Aires, *Tonduz* 3647. Piedro del Convento, *Pittier* 3654. Río General, *Pittier* 3359, 3363.

PANAMA: Gatún, *Hitchcock* 9186. Culebra, *Pittier* 2119; *Amer. Gr. Nat. Herb.* 581; *Hitchcock* 9166. Chagres, *Fendler* 373 (abnormal). El Boquete, *Hitchcock* 8274 (abnormal). Cerro Vaca, *Pittier* 5366, 5370. Balboa, *Hitchcock* 8000 (abnormal). Bohio, *Hitchcock* 8394 (abnormal). Ancón, *Killip* 4029.

TRINIDAD: Maraval, *Broadway* 4912, 4913. Arima, *Hitchcock* 10313. Port of Spain, *Hitchcock* 10052, 10199. St. Joseph, *Amer. Gr. Nat. Herb.* 580.

COLOMBIA: Santa Marta, *Smith* 2129, 2135, 2572.

VENEZUELA: Tovar, *Fendler* 2532, 2544 (abnormal).

EXPLANATION OF PLATE 2.—*Ichnanthus tenuis*. Specimen from Río Grande, Panama, *Pittier* 2119 (U. S. Nat. Herb. no. 975195); also a branch with proliferous spikelets, collected between Bohio and Frijoles, Panama, *Hitchcock* 8394 (U. S. Nat. Herb. no. 946903). Both natural size.

3. Ichnanthus nemorosus (Swartz) Doell.

Panicum nemorosum Swartz, Prodr. Veg. Ind. Occ. 22. 1788. "Jamaica, Domingo." The type has been examined in the Swartz Herbarium at Stockholm. It is from Jamaica.

Milium nemorosum Moench, Meth. Pl. Suppl. 67. 1802. Based on *Panicum nemorosum* Swartz.

Ichnanthus nemorosus Doell in Mart. Fl. Bras. 2^2: 289. 1877. Based on *Panicum nemorosum* Swartz.

DESCRIPTION.

Culms spreading and creeping, rooting at the nodes, much branched, pubescent or glabrescent, the nodes pubescent, the fertile shoots decumbent or rising to the height of 10 to 20 cm.; sheaths shorter than the internodes, pubescent or glabrescent, villous on the margin and collar; blades ovate-lanceolate to elliptic-lanceolate, 3 to 7 cm. long, 1 to 2 cm. wide, clasping at the usually asymmetric base, somewhat abruptly narrowed toward the apex, thin, sparsely hispid and scaberulous on both surfaces or glabrescent; panicles terminal and axillary, 1 to 4 cm. long, ovate or often narrow, the few branches weakly spreading or appressed, usually not over 2 cm. long, the axes angled and scabrous, villous at the base of the branches; spikelets 2.5 to 3 mm. long, glabrous, the pedicels short, 1 to 2 mm. long or less; first glume a little shorter than the second and about as long as the sterile lemma, broad and somewhat clasping at the base, 5-nerved, the lateral nerves contiguous, acuminate or attenuate-pointed, the keel scaberulous above; second glume and sterile lemma 5-nerved, the lateral nerves distant, the glume scaberulous on the keel, acuminate or attenuate-pointed, sometimes with a few hairs near the margin, the lemma smooth on the keel, acute or somewhat rounded at apex, the sterile palea well developed, nearly as long as the lemma; fertile lemma lanceolate, 2 mm. long, acutish, yellow-brown at maturity, the scar at base about 0.3 mm. long, bearing no wing below, the margins somewhat inrolled, distant.

This species resembles *I. pallens*, but is more delicate, has thinner blades, and is usually more prostrate; the spikelets are shorter and more obtuse.

DISTRIBUTION.

Shady banks and rich woods, West Indies, Mexico, and Central America.

San Luis Potosí: Las Canoas, *Pringle* 3827.
Veracruz: Misantla, *Purpus* 6217. Jalapa, *Hitchcock* 6649.
Guatemala: Guatemala City, *Hitchcock* 9047. Cubilquitz, *Türckheim* 4038.
Costa Rica: La Palma, *Tonduz* 12509, 12515. La Esmeralda, *Tonduz* 1346. Santa Rosa du Copey, *Tonduz* 11889. San José, *Hitchcock* 8479.
Panama: El Boquete, *Hitchcock* 8268, 8276, 8318, 8329. Chiriquí Volcano, *Hitchcock* 8195, 8205.
Cuba: Habana, *León* 8635. Sierra de Anafe, *Wilson* 11538 (*León* 2873). Banao Hills, Santa Clara, *León* 3997. La Perla, Oriente, *León* 3908. Retiro, *Wright* 3881. Mogote de Mono, *Wright* 3882. Arroyo Hondo, *Wright* 3858.
Santo Domingo: Without locality, *Poiteau*.
Jamaica: Gordon Town, *Harris* 11476; *Hart* 923. Ramble, *Amer. Gr. Nat. Herb.* 582. Troy, *Hitchcock* 9798. Catherines Peak, *Hitchcock* 9741. Castleton, *Harris* 11296. Clyde River, *Harris* 11447.
Porto Rico: Cayey, *Sintenis* 2406.

LEEWARD ISLANDS: St. Kitts, *Britton & Cowell* 632.
WINDWARD ISLANDS: Grenada, *Broadway* 177.
TRINIDAD: Port of Spain, *Hitchcock* 10041. Caparo Woods, *Broadway* 4931.

EXPLANATION OF PLATE 3.—*Ichnanthus nemorosus*. Specimen from River Estate, Port of Spain, Trinidad, *Hitchcock* 10041 (U. S. Nat. Herb. no. 975139). Natural size.

4. Ichnanthus pallens (Swartz) Munro.

Panicum pallens Swartz, Prodr. Veg. Ind. Occ. 23. 1788. "Jamaica." The type has been examined in the Swartz Herbarium at Stockholm.

Panicum hemignostum Steud. Syn. Pl. Glum. 1: 77. 1854. "Paraguay." The type has been examined at the Paris Herbarium.

Ichnanthus pallens Munro; Benth. Fl. Hongk. 414. 1861. Based on *Panicum pallens* Swartz.

DESCRIPTION.

Culms much branched, spreading, creeping at the base, rooting at the nodes, the fertile culms ascending 30 to 80 cm. or sometimes more, puberulent; sheaths usually glabrous on the surface, villous on the margin; blades lanceolate, often somewhat falcate, 5 to 10 cm. long, mostly 1 to 2 cm. wide, somewhat clasping at the asymmetric narrowed base, somewhat abruptly narrowed to an acuminate point, the lower surface glabrous or slightly scaberulous, roughened with irregular crossveins, sometimes with a few scattered stiff hairs, the upper surface scaberulous, often with a few stiff hairs at the base and on the basal portion of the margin; panicles terminal and from several of the upper axils, 5 to 10 cm. long, rather compact, elliptic, the main branches ascending, as much as 6 cm. long, usually bearing secondary branches, the axes angled and scabrous, pubescent at the base of the branches; spikelets 3 to 3.5 mm. long, glabrous or rarely with a few stiff hairs; first glume 1.5 to 2 mm. long, somewhat clasping at base, attenuate-pointed, scabrous on the keel; second glume longer than the sterile lemma, acuminate but scarcely attenuate-pointed, scabrous on the keel and roughened on the lateral nerves; sterile lemma similar to the second glume, but shorter and less narrowed at the summit, the palea well developed, nearly as long as the lemma; fertile lemma oblong, 1.5 mm. long, rounded at apex, the margins inrolled, distant, the scars at base 0.3 mm. long, narrowly winged at the side.

DISTRIBUTION.

Shady banks and rich woods, tropics of the Western Hemisphere, from southern Mexico and Cuba southward; introduced in southeastern Asia.

VERACRUZ: Córdoba, *Hitchcock* 6454. Jalapa, *Hitchcock* 6675. Mirador, *Liebmann* 400, 401, 740 (abnormal).
CAMPECHE: Atasta, *Rovirosa* 642 (abnormal).
GUATEMALA: Cubilquitz, *Türckheim* 4038. Sepacuité, *Collins & Goll* 011 (abnormal). Senahú, *Goll* 178 (abnormal). Livingston, *Türckheim* 8792.
HONDURAS: San Pedro Sula, *Thieme* 17, 5590, 5594. Puerto Sierra, *Wilson* 614.
COSTA RICA: San José, *Cooper* 5991. Buenos Aires, *Pittier* 10591. Cañas Gordas, *Pittier* 7361. Boca de Zhorquin, *Tonduz* 8636. San Marcos, *Tonduz* 7564. Rodeo de Pacaca, *Pittier* 3269. Luis, *Tonduz* 11393. Terraba, *Tonduz* 3616. Boruca, *Tonduz* 3633.
PANAMA: Matías Hernández, *Pittier* 6923. Bocas del Toro, *Hart* 69, 72, 89. Culebra, *Hitchcock* 8023, 9164. Bas Obispo, *Hitchcock* 9210. Gatún, *Maxon* 4654; *Hitchcock* 9181. Alhajuela, *Pittier* 2335. Corozal, *Hitchcock* 9201. El Boquete, *Hitchcock* 8273, 8302, 8306. San Felix, *Pittier* 5204 (abnormal), 5230, 5272.

CUBA: Monte Verde, *Wright* 750. Sancti Spiritus Mountains, *León* 6524 (abnormal). Camino Aguacate, *Wilson* 9210. Gran Piedra, *Shafer* 9015. Woodfred, *Shafer* 3022. Holguin, *Shafer* 1446. Baracoa, *Pollard, Palmer & Palmer* 15. El Guama, *Palmer & Riley* 130 (abnormal), 218. El Palenquito, *Eggers* 4814. San Diego de los Baños, *León* 4849.

JAMAICA: Red Hills, *Harris* 11837. Ipswich, *Harris* 12511; *Hitchcock* 9619. Devon Pen, *Harris* 12472. Holliss Savanna, *Harris* 12258. Bull Head Mountain, *Hitchcock* 9531. Troy, *Hitchcock* 9799. Claverty Cottage, *Harris* 11523. Castleton, *Harris* 11298, 11485. Port Morant, *Hitchcock* in 1890. Cedar Hurst, *Harris* 11549.

PORTO RICO: Rio Piedras, *Stevenson* 3327; *Hioram* 362; *Wetmore* 171. Sierra de Luquillo, *Eggers* 1172; *Chase* 6717. Maricao, *Sintenis* 214; *Chase* 6196. Bayamon, *Millspaugh* 352; *Heller* 92. Mayaguez, *Holm* 3, 165; *Heller* 4374; *Cowell* 628; *Chase* 6321. Santurce, *Heller* 826. Ponce, *Heller* 6093. Santa Ana, *Goll* 136. Toa Alta, *Goll* 884. Utuado, *Britton & Cowell* 369, 883. Jayuya, *Britton & Cowell* 949. Alegrillo, *Britton, Stevens & Hess* 2576. Monte Montoso, *Britton & Cowell* 4139. Sierra de Naguabo, *Shafer* 3388, 3629. Fajardo, *Britton & Shafer* 1633. Campo Alegre, *Chase* 6805. San Juan, *Chase* 6362, 6405, 6411, 6628, 6629, 6640, 6774. Cayey, *Chase* 6736. Quebradillas, *Chase* 6571. Arecibo, *Chase* 6450. Vega Baja, *Chase* 6418.

SANTO DOMINGO: Sánchez, *Rose* 4333. Santo Domingo City, *Rose* 3748. Without locality, *Wright, Parry & Brummel* 608.

LEEWARD ISLANDS: Antigua, *Rose* 3487; *Wullschlaegel* 619. Montserrat, *Shafer* 710. Guadeloupe, *L'Herminier* 397; *Duss* 2686.

WINDWARD ISLANDS: Martinique, *Duss* 772. Barbados, *Eggers* 7186; *Bot. Sta. Herb.* 458. St. Vincent, *Eggers* 6560. Grenada, *Broadway* 1103, 4615, 4672.

TRINIDAD: *Bot. Gard. Herb.* 2281, 3189, 3191. Port of Spain, *Crueger* 74; *Hitchcock* 9955, 9966; *Amer. Gr. Nat. Herb.* 583, 584. Maraval, *Broadway* 4911. Tamana, *Broadway* 4960. Blanchisseuse, *Broadway* 3820. St. Joseph, *Hitchcock* 10013. San Fernando, *Hitchcock* 10104. Tabaquite, *Hitchcock* 10130. La Brea, *Broadway* 4977. Cedros, *Hitchcock* 10140.

TOBAGO: *Broadway* 4039, 4080; *Eggers* 5685; *Hitchcock* 10240, 10248.

COLOMBIA: Santa Marta, *Smith* 2133.

BRAZIL: *Capanema* 5392, 5453; *Burchell* 1623. Rio Grande do Sul, *Malme* 506; *Lindman* 1413. Campina, *Campos Novaes* 1285 (abnormal), 1286. Rio Janeiro, *Glaziou* 17393, 17404.

PARAGUAY: Sierra de Amambahy, *Hassler* 11269.

ARGENTINA: Misiones, *Ekman* 654, 656.

EXPLANATION OF PLATE 4.—*Ichnanthus pallens*. Specimen from Port of Spain, Trinidad, *Hitchcock* 9955 (U. S. Nat. Herb. no. 946899). Natural size.

5. Ichnanthus axillaris (Nees) Hitchc. & Chase.

Panicum axillare Nees, Agrost. Bras. 141. 1829. "Itambé da Villa et Itacolumí etc. provinciae Minarum." The type specimen, collected by Martius, has been examined at the Munich Herbarium.

Ichnanthus axillaris Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 334. 1917. Based on *Panicum axillare* Nees.

DESCRIPTION.

Culms much branched, spreading or prostrate, rooting at the nodes, the fertile shoots ascending 10 to 20 cm. in open ground, or among shrubs clambering to the height of 1 to 1.5 meters, puberulent or glabrescent; sheaths villous, at least on the margin; blades oval, ovate, or ovate-lanceolate, 3 to 12 cm. long.

1.5 to 3.5 cm. wide, cordate-clasping at base, acute or acuminate, rather thick or firm, pubescent or glabrous beneath, scabrous above; panicles terminal and axillary, similar to those of *I. pallens* but on the average larger, sometimes as much as 20 cm. long; spikelets similar to those of *I. pallens* in arrangement and structure, but usually larger; glumes often sparsely pilose; sterile lemma containing a well-developed palea and a staminate flower; fertile lemma 2 mm. long, with prominent scars at base.

This species is closely related to *I. pallens*, from which it differs in the thicker, proportionately broader blades and larger, often sparsely pilose spikelets.

DISTRIBUTION.

Moist, more or less shaded slopes in the uplands, Porto Rico and Guatemala to Ecuador and Brazil.

GUATEMALA: Cubilquitz, *Türckheim* 7800.
COSTA RICA: "Chemin de Carrillo," *Biolley* 3112.
PANAMA: Frijoles, *Hitchcock* 8398. San Felix, *Pittier* 5203. Juan Diaz, *Killip* 4063.
PORTO RICO: Adjuntas, *Chase* 6472; *Sintenis* 4610; *Britton & Shafer* 2018. Utuado, *Britton & Cowell* 1008. Mayaguez, *Heller* 4479. Cayey, *Chase* 6735. Aybonito, *Sintenis* 2869.
TRINIDAD: Tabaquite, *Hitchcock* 10125; *Amer. Gr. Nat. Herb.* 585. Maraval, *Bot. Gard. Herb.* 5425. Port of Spain, *Hitchcock* 10033.
TOBAGO: *Hitchcock* 10263.
VENEZUELA: Santa Catalina, *Rusby & Squires* 353.
BRAZIL: Paraná, *Dusén* 7911.
ECUADOR: Balao, *Eggers* 14655.

EXPLANATION OF PLATE 5.—*Ichnanthus axillaris.* Specimen from Maraval, Trinidad, *Bot. Gard. Herb.* 5425 (U. S. Nat. Herb. no. 975122). Natural size.

6. Ichnanthus lanceolatus Scribn. & Smith.

Panicum lindeni Fourn. Mex. Pl. **2**: 29. 1886. Not *P. lindeni* Griseb. 1866. The type specimen, collected in Yucatán by Linden, has been examined at the Paris Herbarium.

Ichnanthus lanceolatus Scribn. & Smith, U. S. Dept. Agr. Div. Agrost. Bull. **4**: 36. *pl. 5.* 1897. "Old fields about Izamal. No. 854. George F. Gaumer, September, 1895." The type is in the United States National Herbarium.

DESCRIPTION.

Culms erect or slightly spreading at base, 40 to 60 cm. high, striate, glabrous or puberulent, the nodes about 4, glabrous, or puberulent below the sheath at the margin of the latter; sheaths shorter than the internodes, striate, glabrous on the surface or the lowermost villous, the margin villous; blades lanceolate to ovate-lanceolate, or the lower ovate, 5 to 7 cm. long, 1 to 3 cm. wide, the uppermost reduced, rather firm in texture, glabrous or slightly scaberulous beneath, scabrous above, narrowed from a rounded or cordate base into a petiole 1 to 10 mm. long; panicles terminal or also axillary, 5 to 12 cm. long, the one from the uppermost sheath smaller, the few branches rather stiffly spreading, as much as 6 cm. long, the axes scaberulous; spikelets about 4 mm. long, lanceolate, slightly compressed laterally, glabrous, the pedicels scabrous, unequal, the shorter of the pair about 1 mm. long, the longer about 3 mm.

long; first glume 2 mm. long, broad and clasping at base, acute; second glume and sterile lemma nearly equal, clasping at base, acuminate, the sterile palea small and narrow, about 1 mm. long; fertile lemma nearly 3 mm. long, acute, the margins flat and overlapping toward the apex, inrolled and nearly meeting toward the base, the scar at base very short, extending downward into a minute wing on the very short stipe.

DISTRIBUTION.

Forests and old fields; known only from Yucatán peninsula.

YUCATÁN: Izamal, *Gaumer* 854. Tiap, *Linden.*
QUINTANA ROO: Buena Vista Xbac, *Gaumer* 1111. Chichankanab, *Gaumer* 2181.

EXPLANATION OF PLATE 6.—*Ichnanthus lanceolatus*. Type specimen. Natural size.

7. Ichnanthus nemoralis (Schrad.) Hitchc. & Chase.

Panicum nemorale Schrad.; Schult. Mant. 2: 255. 1824. "In Brasilia, Princeps Sereniss. Maximil. Neowidensis." The type has not been examined but the description identifies the species.

Panicum martianum Nees, Agrost. Bras. 138. 1829. "Habitat ad Almadam [Brazil] (Mart.)." Nees describes three varieties of which the first, α, is the type. This is described as having the sheaths, except the margins, glabrous.

Panicum petiolatum Nees, Agrost. Bras. 140. 1829. "Habitat in udis ad Guaratinguetá, in vicinia Paraibae fluminis, provinciae S. Pauli," Brazil. The type specimen, collected by Martius, was examined in the Munich Herbarium.

Ichnanthus petiolatus Doell in Mart. Fl. Bras. 2^3: 278. 1877. Based on *Panicum petiolatum* Nees.

Ichnanthus martianus Doell in Mart. Fl. Bras. 2^3: 280. 1877. Based on *Panicum martianum* α Nees.

Ichnanthus nemoralis Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 334. 1917. Based on *Panicum nemorale* Schrad.

DESCRIPTION.

Culms as much as 1 meter tall, more or less decumbent at base, pubescent or glabrous; sheaths more or less pubescent, villous on the collar; ligule a ciliate membrane about 1 mm. long; blades elliptic or narrowly lanceolate, up to about 10 or 15 cm. long, as much as 3 cm. wide, narrowed into a petiole 1 to 2 mm. long, many-nerved, pubescent on both surfaces or glabrous above; panicle 10 to 15 cm. long, the few stout branches stiffly ascending, pubescent at base; spikelets about 4.5 mm. long, glabrous, or the glumes slightly roughened on the internerves toward the apex; fruit 3.5 mm. long, the appendages 1.5 mm. long.

DISTRIBUTION.

Among shrubs, Trinidad to Brazil.

TRINIDAD: *Bot. Gard. Herb.* 2278.
TOBAGO: *Broadway*, 4472.
VENEZUELA: Island of Margarita, *Johnston* 208.
BRAZIL: Toca de Onca, *Rose* 26077; *Riedel* 1193, 1194A. Rio Janeiro, *Wilkes Expl. Exped.* 14; *Mertens.* State of Paraná, *Dusén* 7594. Without locality, *Salzmann.*

EXPLANATION OF PLATE 7.—*Ichnanthus nemoralis*. Specimen from Tobago, *Broadway* 4472 (U. S. Nat. Herb. no. 725595). Natural size.

Ichnanthus glaber (Raddi) Hitchc. (*Navicularia glabra* Raddi, Agrost. Bras. 39. 1823; *Panicum navicularia* Nees, Agrost. Bras. 136. 1829). This species has been confused with *Ichnanthus nemoralis* but differs in having narrowly lanceolate blades, glabrous sheaths (including margin), and an open panicle with slender branches and pedicels. The appendages of the fertile lemma are distinctly different, being firm and rather thick, gradually narrowed to a blunt point, extending above the base of the palea for 0.5 mm. and united below to the base of the fruit for about the same distance. The appendages of *I. nemoralis* and its allies are thin membranaceous wings. The notes here given are from a specimen collected by J. N. Rose on Corcovado, Rio de Janeiro, Brazil (no. 20181). The type of *Navicularia glabra*, collected "in saltibus montosis prope Rio-janeiro," has not been examined, but the specimen above cited agrees perfectly with Raddi's description.

There is an *Ichnanthus glaber* Link [1] mentioned as a synonym under *Panicum glaberrimum* Steud. The name has no taxonomic standing, as it was not properly published.

8. Ichnanthus leiocarpus (Spreng.) Kunth.

Panicum leiocarpon Spreng. Neu. Entd. 1: 243. 1820. "Hab. in Brasilia." *Navicularia lanata* Raddi, Agrost. Bras. 40. 1823. "In herbidis prope Rio-Inhumirim," Brazil. This is given as a synonym of *Panicum leiocarpon* by Nees,[2] who probably saw Sprengel's type at Berlin. Raddi describes and figures the glumes and sterile lemma as pubescent at apex, a character which is not mentioned by Sprengel. Sprengel's type has been examined; the spikelets are obscurely pubescent at apex but not bearded as stated by Raddi. As I have not seen Raddi's type, *Navicularia lanata* is included here somewhat doubtfully.

Ichnanthus leiocapus Kunth, Rév. Gram. 1: Suppl. X. 1830. Based on *Panicum leiocarpon* Spreng.

DESCRIPTION.

Culms 1 to 2 meters tall, pubescent; sheaths villous or lanate; ligule a ciliate membrane, the hairs 1 to 2 mm. long; blades narrowly lanceolate, 10 to 20 cm. long, 1 to 3 cm. wide, pilose on both surfaces; panicle large and open, about 30 cm. long, obovoid, the axis villous below, scabrous above, the branches spreading, pubescent at base, these and the branchlets somewhat flexuous; spikelets about 4 mm. long, glabrous; first glume about half as long as spikelet; fruit narrow, brownish, 3 mm. long, the appendages about 1 mm. long.

DISTRIBUTION.

Trinidad to Brazil.

TRINIDAD: *Bot. Gard. Herb.* 3318.
BRAZIL: Bahia, *Riedel* 183. Rio Janeiro, *Beyrich.*

9. Ichnanthus mexicanus Fourn.

Ichnanthus mexicanus Fourn. Mex. Pl. 2: 34. 1886. "Trapiche de la Concepcion [Oaxaca] (Liebm. n. 457)." The type, in the Copenhagen Herbarium, is the terminal part of a culm with a panicle and one or two leaves. The description below is drawn from this specimen.

---

[1] Steud. Syn. Pl. Glum. 1: 94. 1854.
[2] Agrost. Bras. 147. 1829.

DESCRIPTION.

Culms tall, glabrous; sheaths densely villous or glabrate; ligule a very short, densely ciliate membrane; blades (only the upper seen) gradually narrowed from the cordate base to a slender point, 8 to 18 cm. long, as much as 2.5 cm. wide near base, pubescent on both surfaces; panicle 30 cm. long, about 8 cm. wide, rather densely flowered, the branches ascending, clustered, the longer ones as much as 10 cm. long, spikelet-bearing from base; spikelets single or in clusters along the scabrous rachis, 4 to 4.5 mm. long, the pedicels 1 to 2 mm. long, densely scabrous-hispidulous; first glume about as long as the spikelet, 3-nerved, pointed, scabrous, villous along the margins and at the apex; second glume about as long as the fruit, 5-nerved, scabrous, the long hairs sparse or wanting; sterile lemma similar to the second glume but weakly 5-nerved, the palea well developed, ciliate on the keels; fertile lemma about 3 mm. long, the boat-shaped point distinct, the appendages rather firm, ovate-oblong, distinct from near the base, about 0.5 mm. long.

DISTRIBUTION.

Known only from the type collection.

OAXACA: Trapiche de la Concepción, *Liebmann* 457.

EXPLANATION OF PLATE 8.—*Ichnanthus mexicanus*. Type specimen. Natural size.

10. Ichnanthus ichnodes (Griseb.) Hitchc. & Chase.

Panicum ichnodes Griseb. Fl. Brit. W. Ind. 551. 1864. Collected in Trinidad by Crueger near Port of Spain, "heights of S. Anne." The type specimen in the Grisebach Herbarium consists of an incomplete leafy culm and a large spreading panicle.

Ichnanthus ichnodes Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 335. 1917. Based on *Panicum ichnodes* Griseb.

DESCRIPTION.

Plants erect from a somewhat decumbent base, bearing short knotty rootstocks and forming colonies; culms 1 to 2 meters tall, glabrous, or sparingly villous below; sheaths keeled, the lower overlapping, glabrous or sparsely villous, densely villous on the margin and on the collar; ligule a ciliate membrane about 1 mm. long; blades narrowly lanceolate to linear, the lower ones as much as 30 cm. long, 1 to 2 cm. wide, narrowed below, scabrous, sometimes sparsely villous, densely villous above near base; panicle oblong, as much as 30 cm. long, the branches fascicled or branched at base, finally spreading, pubescent or villous at base; spikelets blunt, about 2.5 mm. long; first glume very scabrous on the keel, more than half as long as spikelet, often sparsely villous; second glume roughened toward apex; sterile floret often staminate; fruit 2 mm. long, the appendages 0.5 mm. long.

The elongate blades and the large, much-branched, many-flowered panicles of blunt spikelets give this species the aspect of a species of *Panicum*. The small spikelets lack the point at the ends of the glumes and lemmas, but the appendages at the base of the fertile lemma show that the species belongs to ***Ichnanthus***.

DISTRIBUTION.

Wood borders, in partial shade, Trinidad.

TRINIDAD: Port of Spain, *Amer. Gr. Nat. Herb.* 586, 587; *Bot. Gard. Herb.* 3182. St. Anne, *Crueger* 77. St. Joseph, *Hitchcock* 10178, 10179, 10191. Piarco Savanna, *Hitchcock* 10357. Pitch Lake, *Bot. Gard. Herb.* 2299.

EXPLANATION OF PLATE 9.—*Ichnanthus ichnodes*. Specimen from St. Joseph, Trinidad, *Hitchcock* 10179 (U. S. Nat. Herb. no. 946898). Natural size.

DOUBTFUL OR EXCLUDED SPECIES.

PANICUM SCHLECHTENDAHLII Fourn.; Hemsl. Biol. Centr. Amer. Bot. **3**: 496. 1885, a name only; Fourn. Mex. Pl. **2**: 22, 30. 1886. "P. pallens Schlecht . . . non Sw." No description except the few characters given in the key. These point to *I. nemorosus*.

PANICUM SCHLECHTENDAHLII var. MONSTROSUM Fourn. Mex. Pl. **2**: 31. 1886. "Mirador (Gal. n. 5689)." Galeotti's specimen in the Paris Herbarium is a plant with abnormal spikelets. Probably *I. pallens*.

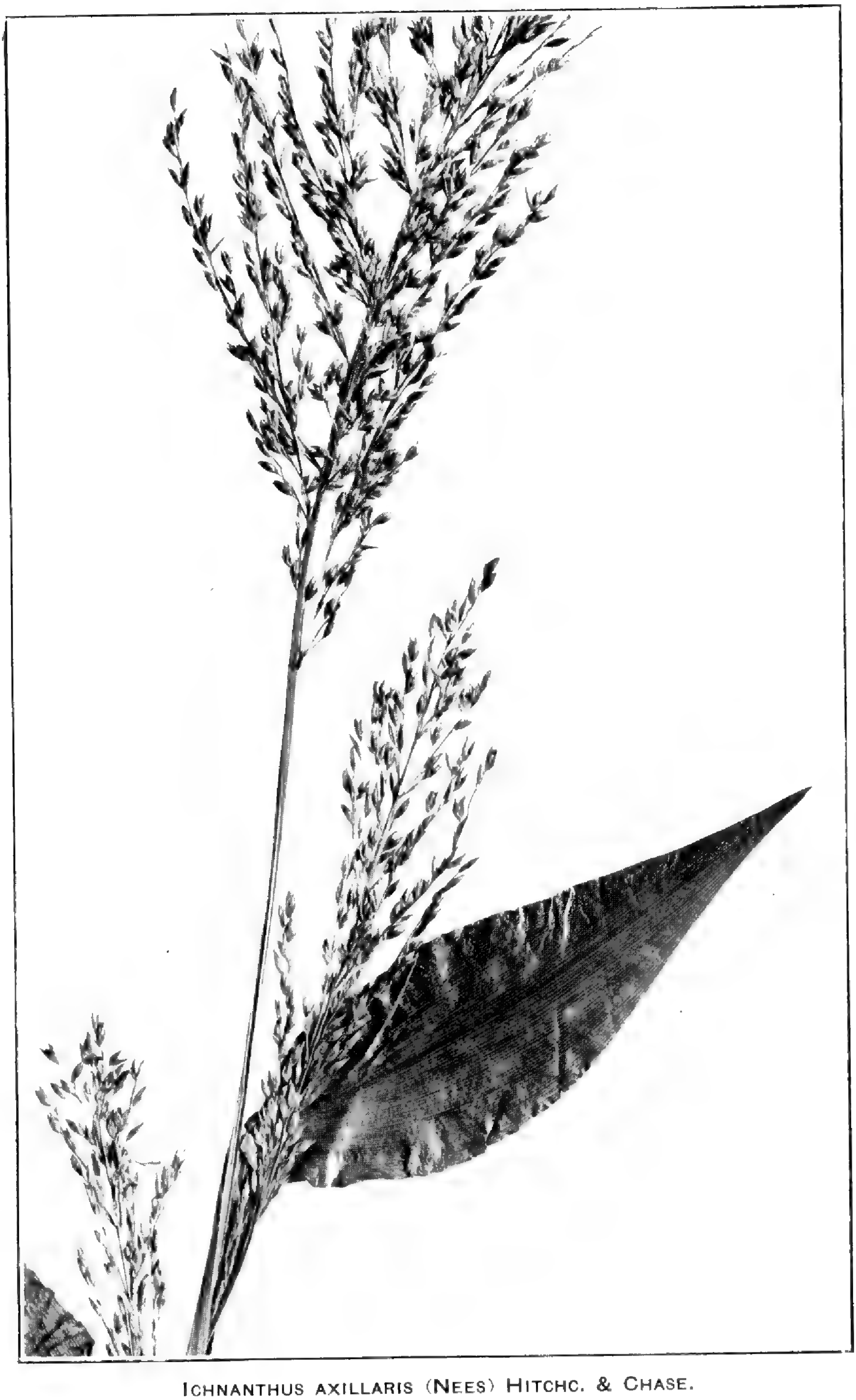
ICHNANTHUS APICULATUS Scribn. U. S. Dept. Agr. Div. Agrost. Circ. **30**: 1. 1901. This is *Panicum cordovense* Fourn.

ICHNANTHUS MAYARENSIS (WRIGHT) HITCHC.

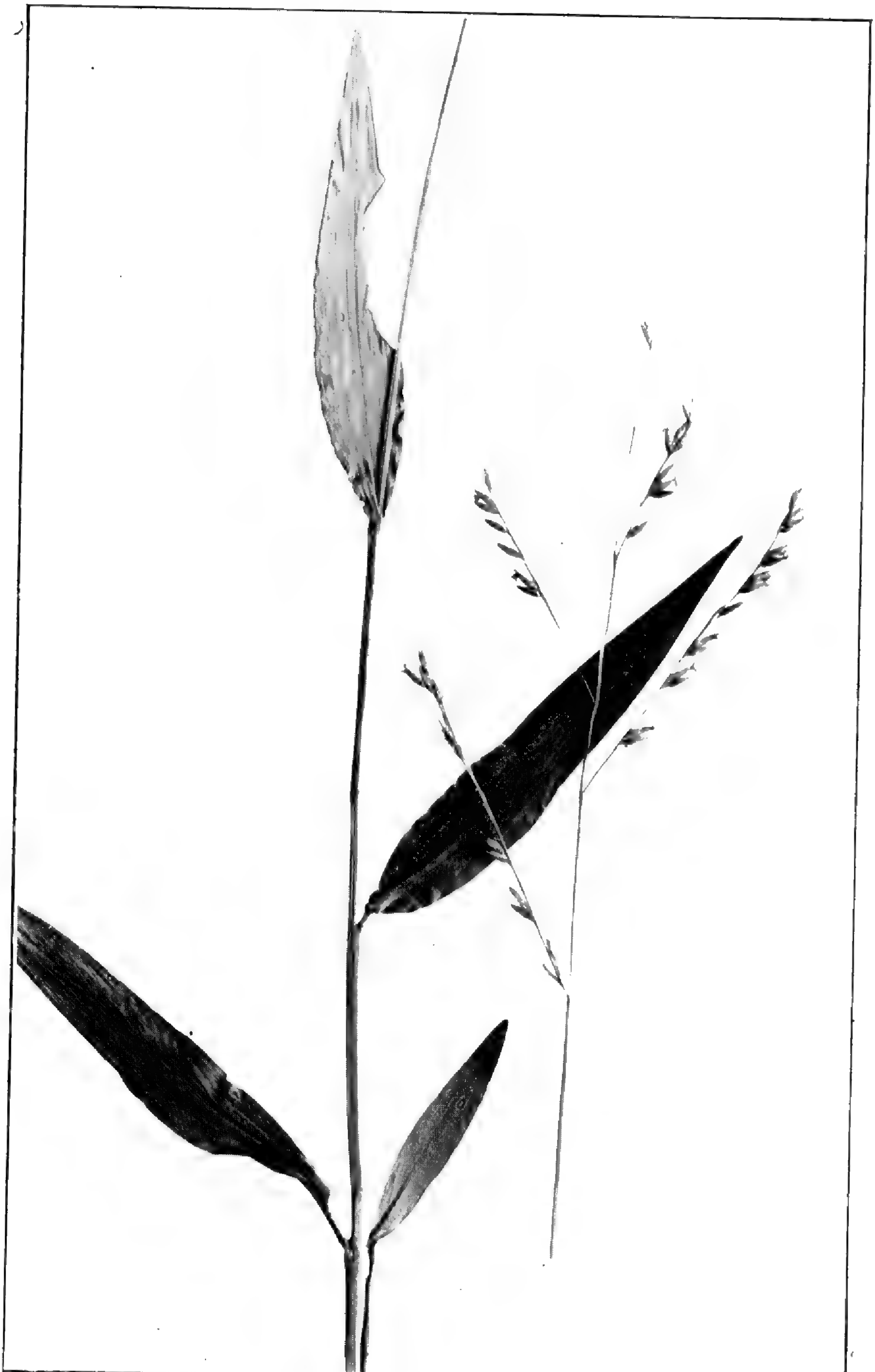
ICHNANTHUS TENUIS (PRESL) HITCHC. & CHASE.

ICHNANTHUS NEMOROSUS (SWARTZ) DOELL.

ICHNANTHUS PALLENS (SWARTZ) MUNRO.



ICHNANTHUS AXILLARIS (NEES) HITCHC. & CHASE.



ICHNANTHUS LANCEOLATUS SCRIBN. & SMITH.

ICHNANTHUS NEMORALIS (SCHRAD.) HITCHC. & CHASE.

ICHNANTHUS MEXICANUS FOURN.

ICHNANTHUS ICHNODES (GRISEB.) HITCHC. & CHASE.

THE NORTH AMERICAN SPECIES OF LASIACIS.

By A. S. Hitchcock.

INTRODUCTION.

Lasiacis is one of the few genera of grasses, excepting bamboos, that have woody culms. It was long included in the allied genus *Panicum*, from which it is well distinguished by the woody culms, the general habit, and the technical characters of the spikelet, especially the shape of the fruit, the oblique position of the spikelets on the pedicels, and the woolly tips to the glumes and lemmas, these tufts of wool having suggested the generic name. Some of the species creep on the floor of the forest and some form a tangled mass of branching culms, while the majority form strong central canes which clamber up through shrubs or over the margins of woods for several meters.

The genus consists of 15 species, all confined to tropical America, one species reaching subtropical Florida.

DESCRIPTION OF THE GENUS AND SPECIES.

LASIACIS (Griseb.) Hitchc.

Panicum section *Lasiacis* Griseb. Fl. Brit. W. Ind. 551. 1864. Five species are included in the section: *P. divaricatum*, *P. sloanei*, *P. lanatum*, *P. compactum*, *P. martinicense*. Grisebach gives a satisfactory diagnosis of the section.

Lasiacis Hitchc. Contr. U. S. Nat. Herb. **15**: 16. 1910. The designated type is *Panicum divaricatum* L.

DESCRIPTION.

Perennial, shrubby, often climbing grasses with much branched culms (herbaceous and simple in *L. procerrima*), flat, often slightly petiolate blades, and open or somewhat contracted panicles terminating the main culm and primary branches, reduced panicles terminating the secondary, often fascicled branches. Spikelets subglobose, ovoid, or ellipsoid, placed obliquely on their pedicels, the glumes and sterile lemma broad, abruptly apiculate, papery-chartaceous, shining, often black at maturity, many-nerved, glabrous, or lanose at the apex only. First glume rarely over one-third the length of the spikelet, somewhat inflated-ventricose. Second glume and sterile lemma subequal, about as long as the fertile lemma, or the glume slightly shorter, the lemma inclosing a membranaceous palea and sometimes a staminate flower, rarely a second sterile lemma present. Fertile lemma white, bony-indurate, obovoid, obtuse, the margins inrolled, inclosing the edges of the indurate palea, both lemma and palea

bearing at the apex in a slight crateriform excavation a tuft of woolly hairs, the palea concave below, gibbous above, the apex often free at maturity.

All the species of *Lasiacis* have woody culms except *L. procerrima*. The spikelets differ from those of *Panicum* in the bony obovoid fruit, pubescent at the apex, the palea concave below and gibbous above.

KEY TO THE SPECIES.

Culms erect, simple, herbaceous; blades as much as 40 cm. long and 5 cm. wide, deeply cordate-clasping. . . . . **1. L. procerrima.**

Culms much branched, woody; blades mostly less than 20 cm. long, narrowed at base or somewhat cordate.

Main stem prostrate, the fertile shoots prostrate, ascending, or erect.

Blades lanceolate, mostly less than 5 cm. long; fertile shoots strongly dorsiventral, mostly prostrate. . . . . **2. L. rugelii.**

Blades linear-lanceolate, about 10 to 12 cm. long; fertile shoots ascending or erect from a decumbent base, not dorsiventral. . . . . **3. L. grisebachii.**

Main stem clambering, or much branched and forming a tangled mass.

Ligule noticeable, brownish, about 2 mm. long.

Blades glabrous beneath, scabrous on both surfaces, elongate, more than 10 times as long as wide; plants not forming a strong central clambering cane. . . . . **4. L. oaxacensis.**

Blades puberulent beneath, glabrous or scabrous above, less than 10 times as long as wide; plants forming a strong central clambering cane. . . . . **5. L. ligulata.**

Ligule inconspicuous, hidden within the mouth of the sheath, rarely as much as 1 mm. long.

Plants not high-climbing, decumbent and rooting at base, forming a tangled mass, with no strong central cane; spikelets clustered toward the ends of the branches. . . . . **6. L. rhizophora.**

Plants high-climbing, forming a strong central cane; spikelets not clustered toward the ends of the branches.

Blades glabrous on both surfaces, often more or less scabrous. (See *L. ruscifolia*, this rarely with glabrous ovate-lanceolate blades.)

Main culm papillose-hispid; lateral flowering branches glabrous; panicles small and narrow . . . . . **7. L. leptostachya.**

Main culm (except sometimes the young shoots) glabrous.

Blades narrow, usually 3 to 4 mm., sometimes 5 mm., wide, 8 to 10 cm. long . . . . . **8. L. harrisii.**

Blades more than 5 mm. wide, if as much as 10 cm. long.

Panicle few-flowered, 5 to 10 cm. long; branches strongly zigzag, the branchlets strongly divaricate or reflexed; blades narrowly lanceolate, firm, mostly less than 1 cm. wide (sometimes wider on vigorous shoots). . . . . **9. L. divaricata.**

Panicles many-flowered, usually 15 to 25 cm. long or more on the primary branches; branches straight or arcuate, not zigzag; blades mostly over 1.5 cm. wide.

Spikelets globose, about 3 mm. long. . . . . **10. L. globosa.**

Spikelets lanceolate-ellipsoidal, 3.5 to 5 mm. long.

Spikelets 4.5 to 5 mm. long, on short stiff appressed pedicels; blades oblong-ovate or elliptic-lanceolate.

11. L. sloanei.

Spikelets 3.5 to 4 mm. long, on flexuous spreading pedicels; blades lanceolate or narrowly-lanceolate.

12. L. patentiflora.

Blades pubescent on one or both surfaces (sometimes glabrous in *L. ruscifolia*).

Blades narrowly lanceolate, averaging 8 to 10 times as long as wide; panicle large and open; spikelets 4 to 5 mm. long. **13. L. sorghoidea.**

Blades ovate-lanceolate or elliptic, sometimes lanceolate, often more or less cordate-clasping; panicle often compact, or at least the branches commonly compactly flowered; spikelets 3 to 4 mm. long.

Sterile lemma 1 . . . . . **14. L. ruscifolia.**

Sterile lemmas 2 . . . . . **15. L. anomala.**

1. Lasiacis procerrima (Hack.) Hitchc.

Panicum procerrimum Hack. Oesterr. Bot. Zeitschr. **51**: 431. 1901. "Costarica: Inter frutices ad fluvium Tiliri prope La Verbena et Alajuelita (Pittier nr. 8819)." Hackel states that this is "Eine ausgezeichnete Art der Series: *Lasiacis* Benth. et Hook. Gen. III. p. 1103."

Lasiacis procerrima Hitchc. Proc. Biol. Soc. Washington **24**: 145. 1911. Based on *Panicum procerrimum* Hack.

DESCRIPTION.

Culms several in a clump, rarely single, succulent, somewhat woody at base but not perennial, erect from a thick woody rootstock, simple, as much as 4 meters high and 1 cm. thick, glabrous, glaucous; sheaths usually overlapping, glabrous or rarely pubescent; ligule inconspicuous; blades narrowly lanceolate, 15 to 40 cm. long, 2 to 5 cm. wide, deeply cordate-clasping, the lobes overlapping, gradually acuminate at apex, glabrous and glaucous, rarely pubescent, the basal lobes sometimes ciliate; panicles open and much branched, as much as 1 meter long, the branches naked below, finally widely spreading, the lower in whorls, as much as 40 cm. long, the main axis smooth, the branchlets and pedicels scabrous; spikelets scattered, 3 to 4 mm. long, ovoid or elliptic.

DISTRIBUTION.

Banks and open woods, central Mexico to northern South America.

SINALOA: Colomas, *Rose* 1687.
TEPIC: Tepic, *Palmer* 1921 in 1892.
JALISCO: Río Blanco, *Palmer* 535 in 1886. Guadalajara, *Pringle* 1732, 11760.
COLIMA: Alzada, *Hitchcock* 7085.
MICHOACÁN: El Ocote, *Langlassé* 540.
VERACRUZ: Córdoba, *Fink* in 1893; *Amer. Gr. Nat. Herb.* 596. Orizaba, *Hitchcock* 6385. Mirador, *Liebmann* 305, 313. Veracruz, *Galeotti* 5717. Huitamalco, *Liebmann* 308. La Loja, *Liebmann* 309.
CHIAPAS: Ocuilapa, *Nelson* 3055.
GUATEMALA: Chinantla, *Seler* 2405. Cubilquitz, *Türckheim* 1028, 8781. El Palmar, *Kellerman* 6247. Cenaguilla, *Heyde & Lux* 3906. Cobán, *Türckheim* 2486. Guatemala City, *Hitchcock* 9067; *Popenoe* 737. Secoyocté, *Cook & Griggs* 119. Secanquím, *Goll* 43.
NICARAGUA: Jinotepe, *Hitchcock* 8694.
COSTA RICA: La Verbena, *Tonduz* 8819. El General, *Pittier* 12057. San José, *Hitchcock* 8445; *Jiménez* 886. Puntarenas, *Hitchcock* 8572. Cañas Gordas, *Pittier* 11011. Alajuela, *Jiménez* 532.

PANAMA: Corozal, *Pittier* 6774. Frijoles, *Hitchcock* 8393. Gatún, *Hitchcock* 7984. El Boquete, *Hitchcock* 8283. Taboga Island, *Hitchcock* 8087. Pedro Miguel, *Hitchcock* 7961.

COLOMBIA: San Andrés de la Sierra, *Pittier* 1645. Santa Marta, *Smith* 117.

VENEZUELA: Without locality, *Fendler* 2429. Caoma, *Jahn* 314.

EXPLANATION OF PLATE 10.—*Lasiacis procerrima.* Specimen from El Boquete, Panama, *Hitchcock* 8283 (U. S. Nat. Herb. no. 946902). Natural size.

2. Lasiacis rugelii (Griseb.) Hitchc.

Panicum rugelii Griseb. Cat. Pl. Cub. 233. 1866. "Cuba occ.; in fruticetis montium pr. Matanzas (Rug. 188)." Grisebach describes the plant as climbing, because Rugel's label had upon it "scandens."

Lasiacis rugelii Hitchc. Bot. Gaz. 51: 302. 1911. Based on *Panicum rugelii* Griseb.

DESCRIPTION.

Culms much branched, prostrate, the main culms slender, mostly about 2 mm., sometimes 2.5 mm. thick, appressed-hispidulous, the sterile shoots prostrate, dorsiventral, the leaves strongly distichous, approximate, the fertile shoots sometimes ascending toward the end; sheaths overlapping, hispidulous, villous on the margin and around the summit; ligule inconspicuous; blades lanceolate or oblong-lanceolate, 2 to 5 cm. long, 4 to 12 mm. wide, hispidulous or puberulent on both surfaces; panicles few-flowered, usually not over 5 cm. long, the few branches spreading, the axes pubescent, scabrous on the angles; spikelets 5 mm. long.

DISTRIBUTION.

Rich thickets, western Cuba, Yucatán, and San Luis Potosí.

SAN LUIS POTOSÍ: San Dieguito, *Palmer* 151 in 1904. Río de las Gallinas, *Purpus* 5438.

QUINTANA ROO: Lake Chichankanab, *Gaumer* 23685.

CUBA: Sierra de Anafe, *Wilson* 11449. Valestina, *Wright* 3465. San Antonio, *Hitchcock* 176. Isle of Pines, *Britton & Wilson* 14860. Without locality, *Reed.*

EXPLANATION OF PLATE 11.—*Lasiacis rugelii.* Specimen from Valestina, Cuba, *Wright* 3465 (U. S. Nat. Herb. no. 975684). Natural size.

3. Lasiacis grisebachii (Nash) Hitchc.

Panicum grisebachii Nash, Bull. Torrey Club 35: 301. 1908. The designated type is from Madruga, Cuba, *Britton & Shafer* 758. Nash gives the specific name because Grisebach[1] refers Wright's no. 3457 to *Panicum martinicense* Griseb. This specimen Nash cites under *P. grisebachii.*

Lasiacis grisebachii Hitchc. Bot. Gaz. 54: 302. 1911. Based on *Panicum grisebachii* Nash.

DESCRIPTION.

Culms much branched, glabrous, the main culms creeping and rooting at the nodes, as much as 2 mm. in diameter, the sterile shoots erect or ascending, 20 to 40 cm. high; sheaths hispidulous, especially on the margin, or the surface glabrescent; ligule inconspicuous; blades narrowly lanceolate, 6 to 12 cm. long, 5 to 10 mm. wide, puberulent beneath, glabrous above, scabrous on the

[1] Cat. Pl. Cub. 233. 1866.

margin; panicles ovate, mostly 5 to 6 cm. (sometimes 10 cm.) long, the few branches rather stiffly ascending, few-flowered; spikelets 4 mm. long, similar to those of *L. divaricata*.

DISTRIBUTION.

Rich thickets, western Cuba; Veracruz to Honduras.

VERACRUZ: Córdoba, *Fink* in 1893.

HONDURAS: Puerto Sierra, *Wilson* 392.

CUBA: Valestina, *Wright* 3457. Matanzas, *Rugel* 187. Bahia Honda, *Shafer* 12006. Jamaica, *León* 1972. Manatí, *León* 5685. San Antonio, *Hitchcock* 131. Pinar del Río, *Baker* 3817. Guanajay, *Baker & Hermann* 4269. Sierra de Anafe, *León* 2874 (*Wilson* 11467); *Wilson* 11309. Buenaventura, *Wilson* 9238, 9332.

EXPLANATION OF PLATE 12.—*Lasiacis grisebachii*. Specimen from Pinar del Río, Cuba, *Baker* 3817 (U. S. Nat. Herb. no. 845457). Natural size.

4. **Lasiacis oaxacensis** (Steud.) Hitchc.

Panicum oaxacense Steud. Syn. Pl. Glum. 1: 73. 1854. "Oaxaca." The type specimen in the Paris Herbarium, collected by Lenormand, consists of a panicle and two leaves.

Lasiacis oaxacensis Hitchc. Proc. Biol. Soc. Washington 24: 45. 1911. Based on *Panicum oaxacense* Steud.

DESCRIPTION.

Plants straggling and branching, but not high-climbing nor with a strong central cane; culms decumbent and geniculate at base, rooting at the lower nodes, the ascending branches 1 to 2 meters long, glabrous; sheaths glabrous or rarely appressed-pubescent, the margin villous; ligule prominent, 2 to 5 mm. long, brownish; blades narrowly lanceolate, 10 to 25 cm. long, 1 to 2 cm. wide, abruptly narrowed at base, long-tapering at apex, scabrous on both surfaces; panicles open, as much as 30 cm. long and nearly as wide, the slender scabrous branches and branchlets ascending or the lower finally spreading, naked below, the spikelets clustered toward the tips, no smaller secondary panicles present; spikelets 4 mm. long, elliptic, often purple.

DISTRIBUTION.

Thickets and copses, southern Mexico to northern South America; also in Jamaica.

VERACRUZ: Pital, *Liebmann* 285. Zacuapan, *Purpus* 2157. Mirador, *Liebmann* 287. Motzorongo, *Smith* 581.

MICHOACÁN: Sierra Madre, *Langlassé* 556.

GUATEMALA: Guatemala City, *Popenoe* 735; *Hitchcock* 9045, 9080, 9107. Sanarate, *Kellerman* 6243. Cubilquitz, *Türckheim* 7701. Retalhuleu, *Kellerman* 6273.

HONDURAS: San Pedro Sula, *Thieme* 5585.

SALVADOR: Santa Ana, *Hitchcock* 8853. San Salvador, *Hitchcock* 8877.

NICARAGUA: Jinotepe, *Hitchcock* 8672, 8698.

COSTA RICA: San José, *Hitchcock* 8488, 8496. Llano Grande de Puriscal, *Jiménez* 887. San Francisco de Guadalupe, *Tonduz* 9818. Alajuela, *Jiménez* 152. Río Bebedero, *Jiménez* 724.

PANAMA: El Boquete, *Hitchcock* 8267, 8281; *Maxon* 4999. Chiriquí Volcano, *Hitchcock* 8199, 8201; *Maxon* 5266. Hato del Jobo, *Pittier* 5422. Gatún, *Hitchcock* 9174; *Maxon* 4653.

JAMAICA: Troy, *Hitchcock* 9800. Lindos Hill, *Harris* 11832. Ipswich, *Hitchcock* 9608. Upper Clarendon, *Harris* 12828.

COLOMBIA: Santa Marta, *Smith* 2142.

ECUADOR: El Recreo, *Eggers* 15572.

EXPLANATION OF PLATE 13.—*Lasiacis oaxacensis*. Specimen from Santa Ana, Salvador, *Hitchcock* 8853 (U. S. Nat. Herb. no. 946904). Natural size.

5. Lasiacis ligulata Hitchc. & Chase.

Panicum divaricatum γ *puberulum* Griseb. Fl. Brit. W. Ind. 551. 1864. Based on Crueger's collection from Trinidad.

Panicum fruticosum Salzm.; Doell in Mart. Fl. Bras. 2¹: 207. 1877, as synonym under *P. latifolium*. This is based on Salzmann's no. 695 from Bahia. I have not seen the type, but a specimen collected at Bahia by Salzmann, probably a part of the type collection, is *Lasiacis ligulata*. Steudel [1] cites Salzmann's name as a synonym under *Panicum praegnans* Steud.

Lasiacis ligulata Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 337. 1917. The designated type is from St. Anns, near Port of Spain, Trinidad (*Hitchcock* 10007).

DESCRIPTION.

Clambering to a height of 5 to 10 meters, the robust glabrous central cane as much as 1 cm. in diameter, the wide-spreading main branches and the arcuate secondary ones not in fascicles, not zigzag; sheaths ciliate on the overlapping margin, otherwise glabrous; ligule a ciliate membrane, brown, 1 to 2 mm. long; blades flat, firm, 6 to 12 cm. long, 0.8 to 1.5 cm. wide, lanceolate, acuminate, narrowed to the base, glabrous on the upper surface, puberulent beneath, the margins scabrous; panicles terminating the numerous branches, exserted or partly included, oval in outline, rather open, 5 to 10 cm. long, usually half to three-fourths as wide, the branches few, spreading, finally reflexed, branching or flowering from near the base, usually bearing 5 to 10 short-pediceled spikelets; spikelets about 4 mm. long, obovoid and purplish black at maturity, the glumes and sterile lemma as well as the fruit with a lanate tuft at the tips.

DISTRIBUTION.

Copses and edges of woods, Guatemala to Ecuador and Brazil; also in Porto Rico. There is a specimen from Mexico (Mirador, *Liebmann* 298) which appears to be of this species, but the blades are glabrous.

GUATEMALA: Cubliquitz, *Türckheim* 4036.

NICARAGUA: Volcán Mombacho, *Baker* 2454.

COSTA RICA: El General, *Pittier* 3365. Buenos Aires, *Tonduz* 3646, 6540. Pacaca, *Pittier* 3245. Talamanca, *Tonduz* 9213, 9492. Sarapiquí, *Biolley* 7465. Los Palmares, *Pittier* 10946. Zhorquin, *Tonduz* 8527. Cartago, *Cooper* 571. Santa María de Dota, *Tonduz* 2247. El Sapote, *Tonduz* 7234. Cañas Gordas, *Pittier* 7359, 11015.

PORTO RICO: Mayaguez, *Britton & Marble* 678. Arecibo, *Chase* 6454. Cayey, *Chase* 6734, 6747. Maricao, *Sintenis* 215. Luquillo Mountains, *Wilson* 350.

[1] Syn. Pl. Glum. 1: 74. 1854.

VIRGIN ISLANDS: St. Thomas, *Britton & Marble* 1230. Tortola, *Shafer* 1147.
TRINIDAD: Port of Spain, *Hitchcock* 9962; *Amer. Gr. Nat. Herb.* 589. St. Joseph, *Hitchcock* 10020. Tabaquite, *Hitchcock* 10120. Caparo Woods, *Broadway* 4923. Tamana Forest, *Broadway* 4952, 4959. Cedros, *Hitchcock* 10151.
TOBAGO: *Hitchcock* 10261, 10262, 10269, 10275; *Broadway* 3551, 4038.
COLOMBIA: Miraflores, *Pittier* 875. Cuesta de Tocotá, *Pittier* 685.
BRITISH GUIANA: *Meyer.*
DUTCH GUIANA: *Hostmann* 512.
FRENCH GUIANA: Iles du Salut, *Sagot* 656.
BRAZIL: Corcovado, *Rose* 20156, 20312. Bahia, *Salzmann.* Santa Rita, *Puttemans* 3657. Paraná, *Dusén* 11487, 14050. Matto Grosso, *Malme* 3357. Rio Janeiro, *Widgren.* Without locality, *Riedel.*

EXPLANATION OF PLATE 14.—*Lasiacis ligulata.* Specimen from Tobago, *Broadway* 4038 (U. S. Nat. Herb. no. 725606). Natural size.

6. Lasiacis rhizophora (Fourn.) Hitchc.

Panicum rhizophorum Fourn. Mex. Pl. **2**: 31. 1886. Several specimens are cited from Orizaba and one from Martinique. The first specimen is selected as the type (Orizaba, *Bourgeau* 3025).

Lasiacis rhizophora Hitchc. Proc. Biol. Soc. Washington **24**: 145. 1911. Based on *Panicum rhizophorum* Fourn.

DESCRIPTION.

Plants branching and straggling, not forming a strong central cane, decumbent at base and rooting at the lower nodes, the fertile culms ascending, 30 to 100 cm. long, glabrous or pubescent; sheaths appressed-hispidulous or glabrescent, villous on the margin; ligule inconspicuous; blades lanceolate to ovate-lanceolate, 7 to 14 cm. long, 1.5 to 3 cm. wide, somewhat cordate at base, rather abruptly narrowed above to an acuminate point, pubescent or scabrous beneath, scabrous above; panicles 8 to 15 cm. long, the branches stiffly ascending, naked below, the spikelets clustered toward their tips, the axes scabrous; spikelets 3 to 4 mm. long, ovoid.

DISTRIBUTION.

Copses and edges of woods, southern Mexico to Costa Rica.

VERACRUZ: Córdoba, *Hitchcock* 6461. Zacuapan, *Purpus* 6205. Orizaba, *Bourgeau* 3025; *Seaton* 60.
GUATEMALA: Chupadero, *Heyde & Lux* 3915. Cobán, *Türckheim* 715. Guatemala City, *Hitchcock* 9051.
COSTA RICA: San Cristóbal, *Wercklé* 518. Alajuela, *Jiménez* 168, 703. Alto del Rodeo, *Pittier* 1616. San José, *Hitchcock* 8502.

EXPLANATION OF PLATE 15.—*Lasiacis rhizophora.* Specimen from Cobán, Guatemala, *Türckheim* 715 (U. S. Nat. Herb. no. 975468). Natural size.

7. Lasiacis leptostachya Hitchc., sp. nov.

Plants forming a stout central cane, with numerous slender branches at the nodes, clambering to the height of several meters; main culms roughened and somewhat cinereous with papillae and irregularly appressed hairs; floral branchlets slender, conspicuously zigzag, smooth, 20 to 40 cm. long; sheaths glabrous or nearly so, densely long-ciliate on the margin, hirsute on the collar; ligule inconspicuous, about 0.5 mm. long; blades narrowly lanceo-

late, 7 to 10 cm. long, 5 to 10 mm. wide, narrowed toward each end, glabrous on both surfaces; panicles small and narrow, rather dense, 2 to 4 cm. long, few-flowered; spikelets about 5 mm. long, oblong-ovoid, pale; first glume about one-third as long as the spikelet; second glume and sterile lemma equal, as long as the spikelet, woolly at tip; fertile lemma as long as the sterile, woolly at the tip.

Type in the U. S. National Herbarium, no. 975428, collected in jungle, Jinotepe, Nicaragua, November 7, 1911, by A. S. Hitchcock (no. 8718).

Known only from the type specimen.

EXPLANATION OF PLATE 16.—*Lasiacis leptostachya*. Type specimen. Natural size.

8. Lasiacis harrisii Nash.

Lasiacis harrisii Nash, Torreya **13**: 274. 1913. The designated type is *Marble* 222 from Cinchona, Jamaica. The specimen is in the herbarium of the New York Botanical Garden.

DESCRIPTION.

Plants bright green, clambering among bushes to the height of 5 meters or more, the main canes slender but strong, the very slender branches pendent, the young twigs commonly rosy purple; sheaths slender, glabrous except the margin and throat, or rarely the young ones sparsely hispid; ligule inconspicuous; blades linear-lanceolate, 5 to 10 cm. long, 2 to 6 mm. wide, gradually narrowed to an acuminate apex, thin and lax, glabrous, the margins scabrous; panicles narrow, mostly less than 5 cm. long, often partially included in the uppermost sheath, the branches short and appressed, the longer usually not more than 1 cm. long, and bearing not more than 4 spikelets; spikelets similar to those of *L. divaricata* but less turgid.

This species is easily recognized by its long narrow blades and pendent branches.

DISTRIBUTION.

Shaded slopes at higher altitudes, Jamaica and Porto Rico. In Jamaica it appears to be confined to the Blue Mountains between 1,000 and 1,500 meters altitude; in Porto Rico it is found at about 800 meters altitude. The specimen from St. Jan was collected on Kings Hill at an altitude of about 250 meters.

JAMAICA: Catherines Peak, *Hitchcock* 9726, 9730; *Harris* 11552. Abbey Green, *Amer. Gr. Nat. Herb.* 588; *Harris* 11587. Strawberry Hill, *Harris* 11487. Cold Spring Gap, *Harris* 11354.

PORTO RICO: Maricao, *Stevens & Hess* 4882; *Chase* 6224, 6228. Quebradillas, *Chase* 6578. Cayey, *Chase* 6742.

VIRGIN ISLANDS: St. Jan, *Eggers* 3121.

EXPLANATION OF PLATE 17.—*Lasiacis harrisii*. Specimen from Maricao, Porto Rico, *Chase* 6228 (U. S. Nat. Herb. no. 946901). Natural size.

9. Lasiacis divaricata (L.) Hitchc.

Panicum divaricatum L. Syst. Nat. ed. 10. **2**: 871. 1759. The type, collected in Jamaica by Patrick Browne, has been examined in the Linnaean Herbarium. It is the small-leaved smooth clambering form of the lowlands.

Panicum bambusoides Desv.; Hamilt. Prodr. Pl. Ind. Occ. 10. 1825. The type in the Paris Herbarium, from Porto Rico, has been examined.

Panicum chauvinii Steud. Syn. Pl. Glum. **1**: 68. 1854. The type has been examined in the Paris Herbarium. It was collected in Guadeloupe by Duchassaing, the specimen having been received from Chauvin.

Panicum divaricatum β stenostachyum Griseb. Fl. Brit. W. Ind. 551. 1864. The type was collected in Jamaica by March. The varietal name might indicate *L. harrisii*, but the specimen in the Grisebach Herbarium is *L. divaricata*.

Lasiacis divaricata Hitchc. Contr. U. S. Nat. Herb. **15**: 16. 1910. Based on *Panicum divaricatum* L.

DESCRIPTION.

Plants usually glabrous throughout, except the margin of the sheaths; culms woody, much branched, clambering over shrubs to the height of 3 to 4 meters, the main culm strong, as much as 6 mm. in diameter, the main branches often fascicled, the vigorous secondary sterile shoots usually strongly divaricate or zigzag, the prophyllum prominent at the base of the branches; sheaths glabrous except the villous or ciliate margin and the sometimes hispid collar; ligule very short, not visible without displacing the blade; blades narrowly lanceolate, 5 to 12 cm. long, 5 to 15 mm. wide, or on the vigorous sterile shoots much larger, narrowed at the base, gradually narrowed above to an acuminate point, scabrous on the margin and sometimes slightly on the surface, the older ones deciduous from the sheaths, the basal portion of the fertile shoots bearing the old sheaths but otherwise naked; panicles terminating the main culm and the fertile branches, ovate or oblong, 5 to 20 cm. long, loosely flowered, the branches distant, spreading or often reflexed, the axes angled, scabrous, flexuous, the lower usually 2 to 4 cm. (sometimes as much as 10 cm.) long, the main branches ordinarily 5 to 10-flowered; spikelets ovoid, about 4 mm. long.

DISTRIBUTION.

Copses and edges of woods at low altitudes, especially in the vicinity of the seacoast, southern Florida, West Indies, and Mexico, south through tropical South America.

FLORIDA: Biscayne Bay, *Palmer* 630 in 1874. Miami, *Rolfs & Quaintance* 935; *Hitchcock* 194, 723; *Chase* 3904. Marco, *Hitchcock* in 1900. South Florida, *Chapman*. Palm Beach, *Curtiss* 5530; *Hitchcock* 2547. Indian River, *Curtiss* 3588. Cutler, *Eaton* 315. Tallahassee Hammock, *Eaton* 418. Key Largo, *Chase* 3930; *Pollard, Collins & Morris* 157. Key West, *Blodgett; Garber; Rugel* 111. Vacca Keys, *Small & Carter* 2864. Brevard County, *Fredholm* 5532.

LOWER CALIFORNIA: Sierra de la Laguna, *Brandegee* in 1890.

SINALOA: Rosario, *Rose* in 1897.

JALISCO: Tequila, *Palmer* 362 in 1886.

SAN LUIS POTOSÍ: Minas de San Rafael, *Purpus* 5439, 5440.

COLIMA: Manzanillo, *Hitchcock* 7027, 7028, 7035, 7044; *Palmer* 1089 in 1890. Alzada, *Hitchcock* 7087, 7099.

VERACRUZ: Pital, *Liebmann* 294. Orizaba, *Hitchcock* 6393. Zacuapan, *Purpus* 2905. Córdoba, *Hitchcock* 6456, 6458. Huitamalco, *Liebmann* 301. Yecoatla, *Liebmann* 288. Jicaltepec, *Liebmann* 295.

YUCATÁN: Mérida, *Schott* 675. Izamal, *Gaumer* 1032.

GUATEMALA: Uaxackanal, *Seler* 3004. Sapacuité, *Cook & Griggs* 138. Trece Aguas, *Lewton* 286. Morales, *Kellerman* 6268. Secanquím, *Goll* 24. Cubilquitz, *Türckheim* 7696. El Palmar, *Kellerman* 6264.

SALVADOR: San Salvador, *Renson* 323.

HONDURAS: Puerto Sierra, *Wilson* 169.

NICARAGUA: Jinotepe, *Hitchcock* 8722, 8723.

COSTA RICA: Nicoya, *Tonduz* 13748. Guanacaste, *Jiménez* 378. Puriscal, *Jiménez* 892. Rodeo, *Pittier* 1615.

PANAMA: Alhajuela, *Pittier* 2342.

BAHAMAS: New Providence, *Hitchcock* in 1890; *Britton & Brace* 187. Rose Island, *Britton & Millspaugh* 2130. Acklins Island, *Brace* 4305. Long Cay, *Brace* 4230. Andros, *Small & Carter* 8586.

CUBA: Valestina, *Wright* 748. Without locality, *Wright* 747. Sierra de Anafe, *Wilson* 11363. Herradura, *Tracy* 9047, 9094. Baracoa, *Pollard, Palmer & Palmer* 76. Nueva Gerona, *Palmer & Riley* 1001. Santiago, *Millspaugh* 1015. Arroyo del Sumidero, *Shafer & León* 13564. Sierra Mendoza, *Shafer* 11149. Woodfred, *Shafer* 3017. Cayo Paloma, *Shafer* 2571. Cayo Coco, *Shafer* 2720. Cayo Sabinal, *Shafer* 1073. Holguin, *Shafer* 1375. Farallón de la Perla, *Shafer* 8751. Río Yamurí, *Shafer* 7827. Sierra la Guira, *Palmer* in 1917. La Magdalena Cayamas, *Baker* 2501, 4611. El Canagre, *Baker* 5198. Habana, *León* 767. Jamaica, *León* 2602. Cojimar, *León* 1970, 1971. San Diego de los Baños, *León* 4662. Sancto Spiritus, *León* 904. Guantánamo, *Britton* 2106. Managua, *Baker & Wilson* 304. Triscornia, *Hitchcock* 158. Isle of Pines, *Millspaugh* 1422.

JAMAICA: Ipswich, *Harris* 12512; *Hitchcock* 9628. Mount Faraway, *Harris* 11486, 11490. Roberts Field, *Harris* 11491. Bryans Hill, *Harris* 11528, 11530. Castleton, *Harris* 11297. Montego Bay, *Hitchcock* 9687. Troy, *Hitchcock* 9802. Savanna-la-Mar, *Hitchcock* 9881. New Forest, *Hitchcock* 9838. Ramble, *Hitchcock* 9519. Holly Mount, *Hitchcock* 9449. Ewarton, *Hitchcock* 9420, 9426, 9427. Southern Manchester, *Harris* 12691. Bog Walk, *Hitchcock* 9304. Inverness, *Harris* 12725, 12740. Kingston, *Hitchcock* 9264, 9268, 9365. Gordon Town, *Hart* 580. Cayman Brac, *Millspaugh* 1226.

SANTO DOMINGO: San Pedro de Macoris, *Rose* 4159, 4441. Santo Domingo City, *Rose* 3739, 4142. López, *Eggers* 2380. Rincón, *Fuertes* 1276. Without locality, *Wright, Parry & Brummel* 615.

HAITI: Morne Ouiville, *Christ* 1898. Gonaive Island, *Cook, Scofield & Doyle* 241.

PORTO RICO: San Juan, *Chase* 6365, 6379, 6782. Vega Baja, *Chase* 6426, 6431. Arecibo, *Chase* 6443, 6560; *Heller* 343. Sierra de Luquillo, *Chase* 6726. Fajardo, *Chase* 6663. Aguadilla, *Chase* 6606. Mayaguez, *Holm* 26; *Chase* 6157, 6310, 6814; *Underwood & Griggs* 144; *Sintenis* 68. Maricao, *Chase* 6192, 6225; *Britton, Stevens & Hess* 2623; *Britton, Cowell & Brown* 4490. Guanica Bay, *Chase* 6521, 6532; *Britton, Cowell & Brown* 4490, 4955. Coamo Springs, *Chase* 6543; *Goll* 699. Utuado, *Chase* 6462. Cayey, *Chase* 6335; *Sintenis* 2318, 2470. Lares, *Chase* 6587; *Sintenis* 5918. Manati, *Chase* 6610. Rio Piedras, *Underwood & Griggs* 252; *Cowgill* 648; *Barrett* 9. Cayo Muertos, *Britton, Cowell & Brown* 5006. Bayamon, *Goll* 227. Vieques, *Chase* 6683. Desecheo, *Hess* 429. Mona Island, *Hess* 454.

VIRGIN ISLANDS: St. Thomas, *Eggers* 189, 292; *Millspaugh* 519. St. Croix, *Rose* 3609; *Ricksecker* 257, 440b. Tortola, *Shafer* 1142.

LEEWARD ISLANDS: Antigua, *Wullschlaegel* 625; *Rose* 3392, 3659, 3660. Montserrat, *Shafer* 700. Guadeloupe, *L'Herminier*.

WINDWARD ISLANDS: Grenada, *Broadway* in 1896.

TRINIDAD: Chacachacare, *Hitchcock* 10062.

TOBAGO: *Hitchcock* 10254, 10256.

COLOMBIA: San Andrés de la Sierra, *Pittier* 1650. Cauca, *Pittier* 886. Without locality, *Triana* 274.

VENEZUELA: Carayaca, *Jahn* 312, 321.

BRAZIL: Campinas, *Campos Novaes* 1282. Organ Mountains, *Wilkes Expl. Exped.* 12. Rio Janeiro, *Glaziou* 20574. San Carlos do Pinhal, *Löfgren* 713. Rio Grande do Sul, *Lindman* 1239. Paraná, *Dusén* 9643.

PARAGUAY: Sierra de Amambahy, *Hassler* 9864, 12087.
PERU: San Miguel, *Cook & Gilbert* 923.
BOLIVIA: Yungas, *Bang* 494.
ARGENTINA: Misiones, *Ekman* 616, 618.

EXPLANATION OF PLATE 18.—*Lasiacis divaricata*. Specimen from Ewarton, Jamaica, *Hitchcock* 9427 (U. S. Nat. Herb. no. 975613). Natural size.

10. Lasiacis globosa Hitchc.

Lasiacis globosa Hitchc. Contr. U. S. Nat. Herb. **17**: 251. 1913. "Type in the U. S. National Herbarium, no. 691226, collected at Acapulco, Mexico, by Edward Palmer (no. 114 in 1894)."

This species is described by Presl[1] under the name *Panicum divaricatum* Lam. The specimen cited is from Acapulco.

DESCRIPTION.

Culms climbing, glabrous; sheaths glabrous, ciliate on the overlapping margin; ligule a narrow pilose membrane about 0.5 mm. long; blades firm, elliptic-lanceolate, scabrous on the margins and upper surface and more or less so beneath, those of the flowering branches 8 to 12 cm. long, 1 to 2 cm. wide; panicle pyramidal, loosely flowered, 6 to 15 cm. long, the branches very scabrous, widely spreading, the longer as much as 7 cm. long; spikelets on scabrous pedicels 1 to 2 cm. long, globose, 3 mm. long; first glume circular, gibbous, nerved, scabrous on the keel, ciliate on the membranaceous margin, about 1 mm. long; second glume and sterile lemma glabrous and shining, equal, a little shorter than the fertile lemma, reticulate-veined, lanate-ciliate on the rounded apex; fertile lemma umbonate, the point protruding from the second glume and sterile lemma, this and the apex of the palea woolly.

Characterized by its smooth blades and close or somewhat open panicle of small globose spikelets.

DISTRIBUTION.

Copses near the sea, southern Mexico to Panama.
GUERRERO: Acapulco, *Palmer* 114 in 1894; *Haenke*.
PANAMA: Chepo, *Pittier* 4688. Taboga Island, *Hitchcock* 8068.

EXPLANATION OF PLATE 19.—*Lasiacis globosa*. Specimen from Acapulco, Mexico, *Palmer* 114 in 1895, type collection (U. S. Nat. Herb. no. 744073). Natural size.

11. Lasiacis sloanei (Griseb.) Hitchc.

Panicum latifolium Hamilt. Prodr. Pl. Ind. Occ. 10. 1825. Not *P. latifolium* L. 1753.

Panicum sloanei Griseb. Fl. Brit. W. Ind. 551. 1864. The species is based on Sloane's plate[2] and Grisebach's two specimens from Jamaica, collected by Purdie and by Wullschlaegel, the second of which has been examined in the Grisebach Herbarium.

Lasiacis sloanei Hitchc. Bot. Gaz. **57**: 302. 1911. Based on *Panicum sloanei* Griseb.

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[1] Rel. Haenk. 1: 306. 1830.
[2] Voy. Jam. 1: *pl. 71. f. 3.* 1707.

DESCRIPTION.

Climbing to a height of 3 or 4 meters, forming a strong central cane, the culms glabrous, the branches solitary or two or three together, elongate; sheaths glabrous except the margin, the collar conspicuously villous; ligule inconspicuous; blades oblong-ovate or elliptic-lanceolate, 10 to 15 cm. long, 2.5 to 4 cm. wide, those of the branches smaller, narrowed at the asymmetric base, abruptly narrowed above to an acuminate point, somewhat papery in texture when dry, glabrous on both surfaces or scabrous above, scabrous on the margin; panicles open and usually loosely few-flowered, 10 to 20 cm. long, the branches distant and widely spreading, the lower as much as 10 cm. long, flexuous, scaberulous; spikelets 4 to 5 mm. long, elliptic.

DISTRIBUTION.

Climbing among bushes and small trees, West Indies and Mexico to South America.

SAN LUIS POTOSÍ: Las Canoas, *Pringle* 3808. Tamasopo Canyon, *Pringle* 3403.
VERACRUZ: Yecoatla, *Liebmann* 288. Consoquitla, *Liebmann* 292. Misantla, *Liebmann* 289. Papantla, *Liebmann* 297.
OAXACA: Cafetal Montecristo, *Reko* 3474.
NICARAGUA: Jinotepe, *Hitchcock* 8673, 8700.
COSTA RICA: Turrialba, *Pittier* 9056; *Tonduz* 8319.
CUBA: San Diego de los Baños, *León* 4563, 5148. Sierra Mendoza, *Shafer* 11147. Sierra de Anafe, *Wilson* 11421. Matanzas, *Rugel* 872. Hanábana, *Wright* in 1865. Valestina, *Wright* 3878. Camoa Hills, *León* 766. Jamaica, *León* 1969. Cojimar, *León* 1973. San Antonio, *Hitchcock* 128. Guanajay, *Baker* 4587. Isle of Pines, *Britton & Wilson* 15134.
JAMAICA: Constant Spring, *Amer. Gr. Nat. Herb.* 590; *Hitchcock* 9280. Troy, *Hitchcock* 9801. Ipswich, *Hitchcock* 9606. Bog Walk, *Amer. Gr. Nat. Herb.* 591. Ewarton, *Hitchcock* 9413. Bryans Hill, *Harris* 11531. Gordon Town, *Harris* 11454. Halls Delight, *Harris* 11260. Ferry River, *Harris* 11325.
SANTO DOMINGO: Without locality, *Wright, Parry & Brummel* 614.
PORTO RICO: San Juan, *Chase* 6412. Mayaguez, *Chase* 6824, 6825. Vieques, *Shafer* 2549, 2570.
LEEWARD ISLANDS: Dominica, *Jones* 49.
WINDWARD ISLANDS: St. Vincent, *Eggers* 6546. Grenada, *Broadway* 947, 1385, 4666, 4674a.
TRINIDAD: Manzanilla, *Hitchcock* 10374.
COLOMBIA: Santa Marta, *Smith* 2145, 2148 in part.

EXPLANATION OF PLATE 20.—*Lasiacis sloanei.* Specimen from Ewarton, Jamaica, *Hitchcock* 9413 (U. S. Nat. Herb. no. 975676). Natural size.

12. Lasiacis patentiflora Hitchc. & Chase.

Lasiacis patentiflora Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 338. 1917. "Type in the U. S. National Herbarium, no. 865566, collected in the edge of woods on a mountain side, center of the island of Tobago, December 20, 1912, by A. S. Hitchcock (no. 10268)."

DESCRIPTION.

High-climbing, with a strong central cane as much as 8 mm. thick, the plant glabrous throughout except at the summit of the sheaths; branches numerous, solitary, widely spreading and finally repeatedly branching, the branches, and branchlets straight or arcuate, divergent at a rather narrow angle; sheaths

with a ring of hairs at the summit or at least a tuft of hairs on either side, sometimes pubescent on the margins toward the summit; ligule about 0.5 mm. long, thin-membranaceous; blades on vigorous shoots as much as 14 cm. long and 2.5 cm. wide, but mostly about 8 to 12 cm. long and 1.5 to 2 cm. wide, acuminate, rounded-tapering to the base, usually somewhat asymmetric, glabrous, scabrous on the margin and somewhat so on both surfaces; panicles numerous, short-exserted, mostly 12 to 20 cm. long, nearly as wide, the slender axis and distant spreading flexuous branchlets angled, scabrous, the pedicels flexuous, spreading; spikelets pale, blotched with dark blue or purple at maturity, 3.4 to 3.8 mm. long, globose-obovoid, the glumes and sterile lemma lanate-ciliate toward the apex; fruit 3 mm. long, 2 mm. wide.

In habit and general appearance *L. patentiflora* resembles *L. sloanei*, from which it differs in the narrower average width of the blades and the more loosely flowered, rather large panicles with smaller spikelets on flexuous spreading pedicels.

DISTRIBUTION.

Borders of woods and jungles, Guatemala to Trinidad and Venezuela; also in Dominica and Paraguay.

GUATEMALA: Cubilquitz, *Türckheim* 8782.
SALVADOR: San Salvador, *Hitchcock* 8962.
NICARAGUA: Jinotepe, *Hitchcock* 8695.
COSTA RICA: Río Cañas, *Jiménez* 720.
LEEWARD ISLANDS: Dominica, *Ramage* in 1889.
TRINIDAD: Port of Spain, *Hitchcock* 10034, 10037, 10323, 10324; *Amer. Gr. Nat. Herb.* 592.
TOBAGO: *Broadway* 4841; *Hitchcock* 10255, 10257, 10268, 10270.
VENEZUELA: Carayaca, *Jahn* 303 in part.
BRITISH GUIANA: Upper Demerara River, *Jenman* 4089.
PARAGUAY: River Pilcomayo, *Rojas* 292.

EXPLANATION OF PLATE 21.—*Lasiacis patentiflora*. Specimen from Tobago, *Hitchcock* 10268, type collection (U. S. Nat. Herb. no. 975660). Natural size.

13. Lasiacis sorghoidea (Desv.) Hitchc. & Chase.

Panicum lanatum Swartz, Prodr. Veg. Ind. Occ. 24. 1788. Not *P. lanatum* Rottb. 1776. "Jamaica." The type specimen, marked "Jamaica, *Swartz*," has been examined in the Swartz Herbarium at Stockholm.

Panicum sorghoideum Desv.; Hamilt. Prodr. Pl. Ind Occ. 10. 1825. "Porto Rico." The type specimen in the Paris Herbarium is labeled with some uncertainty as to locality, "America aequinox., Hispaniola." The note, "Je ne vois pas en quoi ce Panicum différe du *P. glutinosum*," shows a close connection with the note under the original description. "Habitu P. latifolio affine, ab illo autem aeque ac P. glutinoso distinctum."

Panicum orinocense Willd.; Spreng. Syst. Veg. 1: 316. 1825, as synonym under *P. glutinosum* Lam. The type, received from Humboldt, is in the Willdenow Herbarium.

Panicum praegnans Steud. Syn. Pl. Glum. 1: 74. 1854. "*P. fruticosum* Salzm. Oaxaca. Bahia." The fragmentary Oaxaca specimen, collected by Buchinger, is in the Steudel Herbarium at Paris. This appears to be *Lasiacis sorghoidea*. Salzmann's Bahia collection, labeled *P. fruticosum*, is *Lasiacis ligulata*. Steudel's description is not sufficient to distinguish between the two

species. The Oaxaca specimen is regarded as the type, as this is the one in the Steudel Herbarium.

Panicum lanatum sorghoideum Griseb. Fl. Brit. W. Ind. 551. 1864. Based on *Panicum sorghoideum* Desv.

Panicum martinicense Griseb. Fl. Brit. W. Ind. 552. 1864. "Jamaica! *Wullschl.;* [Martinique!, Panama!, Guiana]." Because of the specific name the plant from Martinique is taken as the type. This is the specimen mentioned earlier in the description, "P. fuscum, *Sieb. Mart.* 29."

Panicum swartzianum Hitchc. Contr. U. S. Nat. Herb. **12**: 140. 1908. Based on *P. lanatum* Swartz, not *P. lanatum* Rottb.

Lasiacis swartziana Hitchc. Bot. Gaz. **51**: 302. 1911. Based on *Panicum swartzianum* Hitchc.

Lasiacis sorghoidea Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 338. 1917. Based on *Panicum sorghoideum* Desv.

DESCRIPTION.

Culms much branched, erect or clambering to a height of 5 to 7 meters, the strong central cane as much as 1 cm. thick, glabrous or pubescent, the main branches sometimes 1 meter long or more, arcuate, bearing slender branchlets toward the pendent ends, or the branchlets fascicled on the main culm, the young shoots usually pubescent; sheaths pubescent, especially on the margin and collar, the surface sometimes glabrate; ligule inconspicuous; blades lanceolate or elliptic-lanceolate, those of the main culm or of vigorous shoots as much as 20 cm. long and 3 cm. wide, those of the fertile branches usually 8 to 12 cm. long and 1.5 cm. wide, or on the fascicled branchlets smaller, often falcate, velvety on both surfaces or only puberulent or glabrate above; panicles on the main culm and larger branches usually 10 to 20 cm. long, at maturity as wide or wider, rather compactly many-flowered, the branches long and again branched, the axes very scabrous; spikelets 4 to 5 mm. long.

The specimens cited vary in the amount of pubescence, but all are at least puberulent on the under surface of the blades. In some the young shoots are conspicuously villous or velvety-pubescent; in others they are glabrous. Possibly these represent distinct species. In general the main or primary panicles are large, and rather open with ascending branches. Extended field study of this complex group is necessary before it can be satisfactorily elaborated.

DISTRIBUTION.

Ravines, hedges, and borders of woods throughout tropical America.

SAN LUIS POTOSÍ: Las Canoas, *Pringle* 3808.

JALISCO: Guadalajara, *Hitchcock* 7348. San Nicolás, *Hitchcock* 7207.

GUANAJUATO: *Dugés* in 1897.

MICHOACÁN: Morelia, *Arsène* in 1909.

VERACRUZ: Zacuapan, *Purpus* 3779, 6206. Mirador, *Mohr* in 1857; *Ross* 613; *Liebmann* 296, 300. Tlapacoyo, *Liebmann* 293. Misantla, *Liebmann* 289. Orizaba, *Smith* 581; *Bourgeau* 2648; *Hitchcock* 6389. Jalapa, *Hitchcock* 6642, 6674, 6680; *Rose* 6144. Córdoba, *Bourgeau* "1459 and 1936"; *Fink* in 1893; *Seaton* 393; *Hitchcock* 6442, 6455, 6458. Colipa, *Liebmann* 290.

MORELOS: Cuernavaca, *Ross* 254; *Pringle* 5960, 6663; *Hitchcock* 6824.

OAXACA: Tomellín Canyon, *Pringle* 6701. Tuxtepec, *Nelson* 372. Trapiche de la Concepción, *Liebmann* 284. San Pablo Huitzo, *Conzatti* 2012.

GUATEMALA: Guatemala City, *Hitchcock* 9036, 9053, 9057, 9101; *Kellerman* 4735. Cobán, *Pittier* 1787. Los Amates, *Kellerman* 4786, Sierra de las Minas, *Kellerman* 6233. Río Dulce, *Smith* 1852. Without locality, *Heyde* 362.

SALVADOR: San Salvador, *Hitchcock* 8925, 8951, 8952. Lake Ilopango, *Hitchcock* 8921.

NICARAGUA: Jinotepe, *Hitchcock* 8665, 8674. 8690, 8699.

COSTA RICA: Talamanca, Tonduz 9493. Terraba, *Pittier* 3638. Tuis, *Tonduz* 8186, 11397. Nicoya, *Tonduz* 13755. Las Pavas, *Pittier* 3114. San José *Pittier* 81; *Tonduz* 7207, 7234; *Cooper* 5998; *Hitchcock* 8451. Cartago, *Pittier* 7110; *Cooper* 98; *Smith* 4891, 4991; *Tonduz* 10423; *Maxon* 128. Tsaki, *Tonduz* 9434. Buenos Aires, *Tonduz* 4858. San Ramón, *Tonduz* 14375, 17908. El General, *Pittier* 3366. Boruca, *Pittier* 4455. Cañas Gordas, *Pittier* 11015. Río Ceiba, *Tonduz* 4858. Carrillo, *Biolley* 3106. Tres Rios, *Pittier* 4328. Río Navarrito, *Pittier* 2406. Calabaza, *Tonduz* 10871. Rodeo, *Pittier* 1616. Shirores, *Tonduz* 9213. Tiribí, *Tonduz* 3076. Pacaca, *Pittier* 3332.

PANAMA: El Boquete, *Hitchcock* 8269, 8270, 8282, 8286, 8311, 8315. Matías Hernández, *Pittier* 6924. Cerro Vaca, *Pittier* 5331, 5339. Gatún, *Hitchcock* 9175, 9177, 9182. Toro Point, *Hitchcock* 8054. Ancón, *Célestine* 63; *Williams* 4. Chagres, *Fendler* 371. Culebra, *Pittier* 2118. Miraflores, *Pittier* 2196. Pedro Miguel, *Hitchcock* 7955. Balboa, *Hitchcock* 8003.

CUBA: Rincón, *Shafer* 12323.

JAMAICA: New Forest, *Hitchcock* 9837, 9892, 9893. Catherines Peak, *Amer. Gr. Nat. Herb.* 593. Troy, *Hitchcock* 9796, 9808, 9813, 9817; *Harris* 12650. Ewarton, *Hitchcock* 9409. Gordon Town, *Hitchcock* 9380, 9381, 9382; *Hart* 685, 813. Newcastle, *Hitchcock* 9335; *Harris* 11398. Constant Spring, *Hitchcock* 9258. Salt Hill, *Harris* 11410. Flamstead, *Harris* 11469. Rams Horn Range, *Hitchcock* 9569, 9570, 9571. Richmond Hill, *Millspaugh* 1968. Upper Clarendon, *Harris* 12768. Mt. Lebanon, *Harris* 12488.

PORTO RICO: Mayaguez, *Chase* 6809, 6822, 6823; *Heller* 4375; *Holm* 74, 116. Vega Baja, *Chase* 6419. Arecibo, *Chase* 6457. San Juan, *Chase* 6760. El Yunque, *Chase* 6728. Maricao, *Chase* 6218. San German, *Hess* 75. Coamo, *Sintenis* 3062. Aibonito, *Sintenis* 2861.

VIRGIN ISLANDS: St. Croix, *Rose* 3624; *Ricksecker* 289. St. Thomas, *Millspaugh* 520; *Britton, Britton & Shafer* 141.

LEEWARD ISLANDS: Antigua, *Rose* 3453, 3484, 3493, 3647. Montserrat, *Shafer* 253, 255, 701. Guadeloupe, *Duss* 3183, 3613.

WINDWARD ISLANDS: Martinique, *Duss* 770. Grenada, *Eggers* 6224; *Broadway* 4674.

TRINIDAD: Port of Spain, *Amer. Gr. Nat. Herb.* 594; *Hitchcock* 9950½, 9963, 9980, 10035, 10317. St. Joseph, *Hitchcock* 10170. Tabaquite, *Hitchcock* 10131. Chacachacare, *Hitchcock* 10061, 10064. Oropuche, *Broadway* 4976. Caparo, *Broadway* 4924. Without locality, *Bot. Gard. Herb.* 2298, 3190.

TOBAGO: *Hitchcock* 10247.

COLOMBIA: Santa Marta, *Smith* 2144, 2147, 2148, 2258.

VENEZUELA: Palmasola, *Pittier* 6384. Caracas, *Rose* 21774.

BRAZIL: Campinas, *Campos Novaes* 1237, 1238. Minas Geraes, *Regnell* 308. Cuyabá, *Malme* 1544B, 1723. Corumbá, *Malme* 3053. Matto Grosso, *Lindman* 3185. Without locality, *Burchell* 6507.

PARAGUAY: Colonia Elisa, *Lindman* 1701. Central Paraguay, *Morong* 641, 755. Pilcomayo River, *Morong* 1569.

ECUADOR: Between Río and Salto, *Jameson* in 1864. Gualea, *Sodiro* 3118, 3121.
BOLIVIA: Guanal, *Rusby* 191. Cochabamba, *Bang* 1289, 1291.
ARGENTINA: Misiones, *Ekman* 617, 619.

EXPLANATION OF PLATE 22.—*Lasiacis sorghoidea*. Specimen from Mayaguez, Porto Rico, *Holm* 116 (U. S. Nat. Herb. no. 733619). Natural size.

14. Lasiacis ruscifolia (H. B. K.) Hitchc.

Panicum ruscifolium H. B. K. Nov. Gen. & Sp. 1: 101. 1816. "Crescit in apricis et aridis Regni Mexicani, in radicibus montis ignivomi, Volcan de Jorullo."

Panicum compactum Swartz, Adnot. Bot. 14. 1829. Not *P. compactum* Kit. 1814. This was briefly described after Swartz's death by Wikström, who considered it distinct from *Panicum divaricatum* L. because of the dense panicle and wide blades. The specimen in the Swartz Herbarium at Stockholm is a single shoot with three leaves and an ovoid panicle about 8 cm. long. The spikelets are 3 to 3.5 mm. long.

Panicum megacarpum Steud.; Griseb. Fl. Brit. W. Ind. 551. 1864. This name is given by Grisebach as a synonym of *P. lanatum β sorghoideum* and credited to "Steud. in Pl. Lechler, 2219."

Panicum liebmannianum Fourn. Mex. Pl. 2: 33. 1886. "Consoquitla (Liebm. n. 299)." The type has been examined in the Copenhagen Herbarium. The panicles are narrow and compact, the blades pubescent beneath and minutely so above, the spikelets about 3.5 mm. long.

Lasiacis compacta Hitchc. Bot. Gaz. 51: 302. 1911. Based on *Panicum compactum* Swartz.

Lasiacis ruscifolia Hitchc. Proc. Biol. Soc. Washington 24: 145. 1911. Based on *Panicum ruscifolium* H. B. K.

Lasiacis liebmanniana Hitchc. Proc. Biol. Soc. Washington 24: 145. 1911. Based on *Panicum liebmannianum* Fourn.

DESCRIPTION.

More robust than any other species, freely branching, the shoots usually strongly dorsiventral; culms becoming several meters long, glabrous or rarely puberulent; sheaths often overlapping, glabrous on the surface or sometimes hispidulous toward the apex (in some Central American specimens papillose-hispid throughout), glabrous or often ciliate or villous on the margin, especially near the summit, the collar glabrous or villous; ligule inconspicuous; blades ovate-lanceolate or elliptic, sometimes lanceolate, the primary ones 10 to 15 cm. long, 3 to 6 cm. wide, narrowed or often cordate-clasping at the asymmetric base, rather abruptly narrowed to an acuminate but not attenuate apex, puberulent or glabrous beneath, glabrous or scabrous above, the secondary blades similar or reduced; panicles narrow and compact, 5 to 20 cm. long, or often with distant lower branches, these compactly flowered, or the panicle rarely somewhat open, with spreading, implicate but rather closely flowered branches, the axes hispidulous and scabrous; spikelets 3 to 4 mm. long, nearly globose at maturity.

This species is variable as to pubescence, and the panicles, at first dense, may with age become rather open. The blades are usually cordate and somewhat clasping and proportionately wider than in any other species. The specimens from the West Indies and Mexico have the blades pubescent beneath, but from Central America there are many specimens with glabrous blades. The latter region furnishes also specimens with papillose-hispid sheaths, in which the blades may be glabrous or pubescent beneath.

DISTRIBUTION.

Climbing over bushes, Mexico to northern South America; also in Cuba and Jamaica.

SONORA: Sierra de Alamos, *Rose* 12822.
CHIHUAHUA: Norogachi, *Palmer* 10 in 1885.
SINALOA: Imala, *Palmer* in 1891. Culiacán, *Brandegee* in 1904. San Blas, *Rose* 13369. Mazatlán, *Rose* 14112. Lodiego, *Palmer* 1645 in 1891. Rosario, *Rose* 14521.
DURANGO: Huasemote, *Rose* 3502.
TEPIC: Acaponeta, *Rose* 14409.
COLIMA: Manzanillo, *Hitchcock* 7034. Alzada, *Hitchcock* 7079.
MICHOACÁN: El Calabazal, *Langlassé* 458. Vallecitos, *Langlassé* 361.
MORELOS: Yautepec, *Pringle* 11293.
GUERRERO: Tlalixtaquilla, *Nelson* 2254. Acapulco, *Palmer* 115 in 1895.
JALISCO: Guadalajara, *Hitchcock* 7368.
OAXACA: San Miguel, Sadani, *Liebmann* 283. Trapiche de la Concepción, *Liebmann* 284. Río de Conaltepec, *Liebmann* 282. San Agustín, *Liebmann* 281. Guatulco, *Liebmann* 280. Oaxaca, *Conzatti & González* 1103.
VERACRUZ: Consoquitla, *Liebmann*, 299. Misantla, *Purpus* 5978. Zacuapan, *Purpus* 7877.
YUCATÁN: Izamal, *Gaumer* 878, 1025. Mérida, *Schott* 600.
GUATEMALA: Salamá, *Seler* 2446. Jumaytepeque, *Heyde & Lux* 3899. Cubilquitz, *Türckheim* 8620.
HONDURAS: San Pedro Sula, *Thieme* 31, 5585.
SALVADOR: Sonsonate, *Hitchcock* 8979, 8982. Santa Ana, *Hitchcock* 8850. San Salvador, *Hitchcock* 8903.
NICARAGUA: Corinto, *Hitchcock* 8743. Jinotepe, *Hitchcock* 8676, 8715, 8717, 8719. Quesalguague, *Baker* 2105. Masaya, *Hitchcock* 8710. San Juan del Sur, *Hitchcock* 8607.
COSTA RICA: Nicoya, *Tonduz* 13759. Las Vueltas, *Tonduz* 12858. Puntarenas, *Hitchcock* 8570, 8571, 8577, 8581. Surubres, *Biolley* 17383. Colonia Carmona, *Jiménez* 361, 369, 376. Alajuela, *Jiménez* 531. Río Bebedero, *Jiménez* 725.
PANAMA: Matías Hernández, *Pittier* 6892. Balboa, *Hitchcock* 8060. Panama, *Hitchcock* 9204. Old Panama, *Hitchcock* 8401. Aguadulce, *Pittier* 4987, 4998. Taboga Island, *Célestine* 47; *Pittier* 3603.
CUBA: Ensenada de Mora, *Britton, Cowell & Shafer* 12979. Sancti Spiritus, *León* 905. Guantánamo, *León* 3778. Isle of Pines, *Palmer & Riley* 904; *Curtiss* 520; *Britton, Britton & Wilson* 14659, 15065.
JAMAICA: Without locality, *Swartz* (in Swartz Herbarium at Stockholm).
COLOMBIA: Santa Marta, *Smith* 174.
VENEZUELA: La Moka (Siquire Valley), *Eggers* 13480.
PARAGUAY: Central Paraguay, *Morong* 755.

EXPLANATION OF PLATE 23.—*Lasiacis ruscifolia*. Specimen from Santa Ana, Salvador, *Hitchcock* 8850 (U. S. Nat. Herb. no. 946905). Natural size.

15. Lasiacis anomala Hitchc.

Lasiacis anomala Hitchc. Journ. Washington Acad. Sci. 9: 37. 1919. "Type in the U. S. National Herbarium, no. 865557, collected along the edge of jungle, Fort George Road, Port of Spain, Trinidad, November 27, 1912, by A. S. Hitchcock (Amer. Gr. Nat. Herb. no. 595)."

DESCRIPTION.

Culms woody, branching, clambering over bushes, glabrous, the main culm as much as 5.5 mm. thick, and 5 meters long; sheaths glabrous or more or less pilose, striate, ciliate, densely villous on the collar; ligule a short ciliate membrane; blades ovate-lanceolate or elliptic-lanceolate, as much as 10 cm. long and 3 cm. wide on the main flowering culms, usually 4 to 6 cm. long and 1 to 2 cm. wide on the lateral flowering branches, rather thin, narrowed and usually asymmetric at base, sometimes a little cordate-clasping, puberulent, or sometimes glabrate on the upper surface; panicles oblong-ovoid, 7 to 10 cm. long, 3 to 5 cm. wide, those on the lateral branches smaller, the lower branches somewhat distant, spreading or somewhat reflexed, all rather compactly flowered, puberulent, the pedicels angled, rather stout, 1 to 2 mm. long; spikelets ovoid, becoming nearly globose at maturity, 3 to 4 mm. long; first glume about one-third, second glume about two-thirds, as long as the spikelet; first and second sterile lemmas about equal and about as long as the fertile lemma, the glumes and lemmas slightly woolly at the tip, the second sterile lemma infolding the fruit more closely than usual for the first lemma in other species; fruit ovoid-globose, obtuse, because of the presence of a second sterile lemma the palea side facing the second glume.

This species has been confused with *L. ruscifolia* and was included under that name in a recent account of the grasses of the West Indies,[1] in which the following statement appears: "In all the Trinidad specimens the spikelets contain a second sterile lemma, a character not found in any other species known to us. This second sterile lemma equals the first, contains a hyaline palea, and infolds the fruit rather more closely than the sterile lemma commonly does in other species. The fruit borne one joint higher on the rachilla consequently faces in the direction opposite to the one usual in Paniceae; that is, the palea side of the fruit faces the second instead of the first glume." A reconsideration of the group led the writer to the conclusion that, "we have here a distinct species, for not only is there this unusual character of a second sterile lemma but also a distinct geographical range. Of the group to which it had been referred, all the specimens from Trinidad, the lower Orinoco, and eastern Brazil have a second sterile lemma, while outside of this range, that is, north and west, there is but one sterile lemma in all the specimens examined. In other respects, such as shape of blades and panicle, pubescence, and shape and size of spikelets, the new species does not differ from *L. ruscifolia*, from which it has been separated. The specimens of the new species, *Lasiacis anomala*, agree closely among themselves in all these characters, but also agree with many specimens referred to the more variable species, *L. ruscifolia*."

DISTRIBUTION.

Copses and edges of forest, Trinidad to eastern Brazil.

TRINIDAD: Port of Spain, *Amer. Gr. Nat. Herb.* 595; *Hitchcock* 10001. St. Joseph, *Hitchcock* 10021. San Fernando, *Hitchcock* 10117. Chacachacare, *Hitchcock* 10063. Cedros, *Hitchcock* 10136. St. Margarets, *Broadway* 2627. Moruga, *Broadway* 2504. Without locality, *Broadway* 2564; *Bot. Gard. Herb.* 2303.

VENEZUELA: Santa Catalina, *Rusby & Squires* 358. Island of Margarita, *Miller & Johnston* 184.

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[1] Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 339. 1917.

BRAZIL: Rio Branco, *Kuhlmann* 3358. Ceara, *Gardner* 1889, 1894.

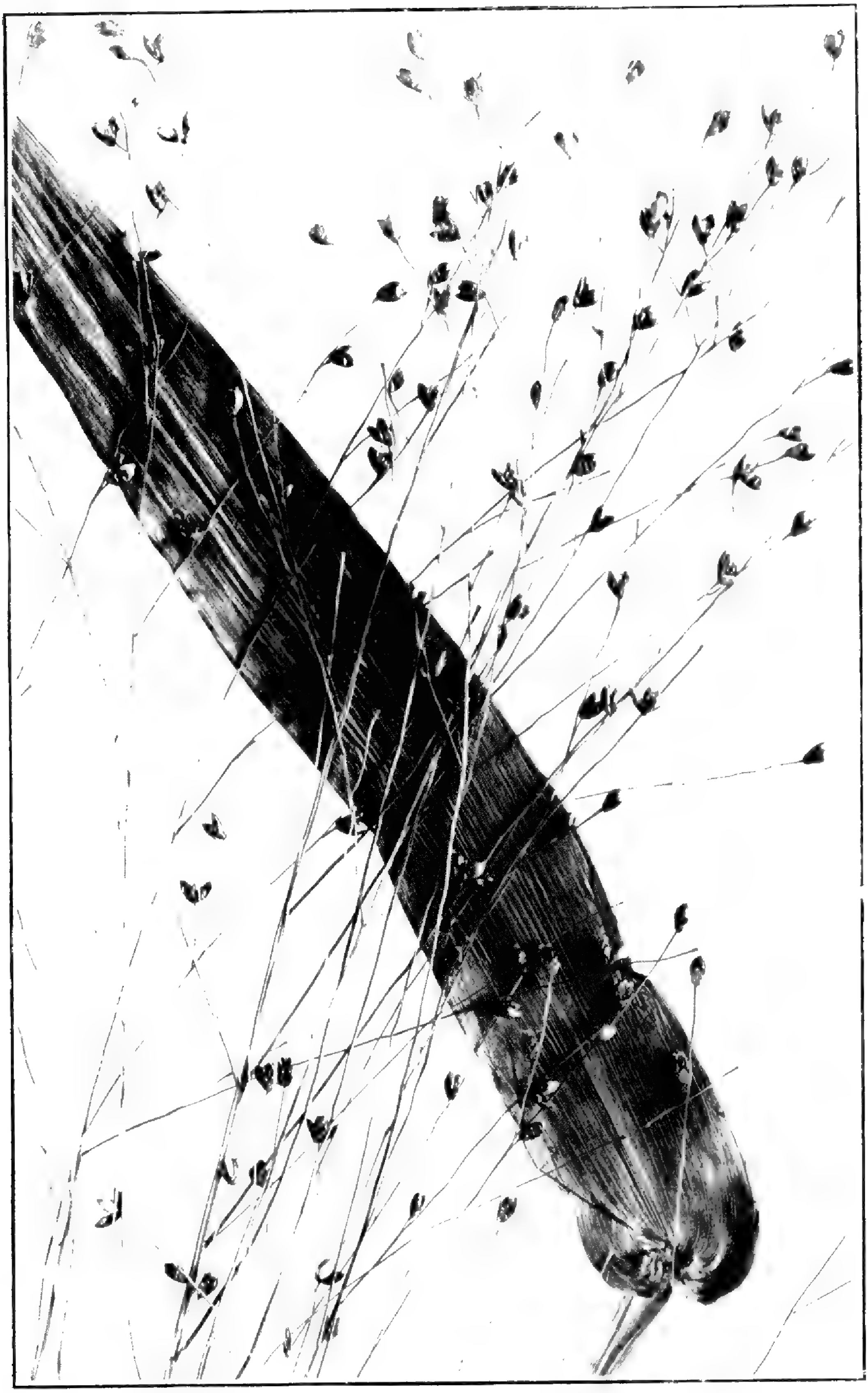
EXPLANATION OF PLATE 24.—*Lasiacis anomala.* Specimen from Cedros, Trinidad, *Hitchcock* 10136 (U. S. Nat. Herb. no. 975574). Natural size.

DOUBTFUL SPECIES.

PANICUM MACULATUM Aubl. Pl. Guian. 1: 51. 1775. This can not be identified from the brief description. The species described under this name by Schultes (Mant. 2: 238. 1824) appears to be *Lasiacis ligulata.*

PANICUM GLUTINOSUM Lam. Tabl. Encycl. 1: 174. 1791. Not *Panicum glutinosum* Swartz, 1788. Probably *Lasiacis sorghoidea.*

PANICUM AGGLUTINANS Kunth, Enum. Pl. 1: 120. 1833. Based upon *Panicum glutinosum* Lam.



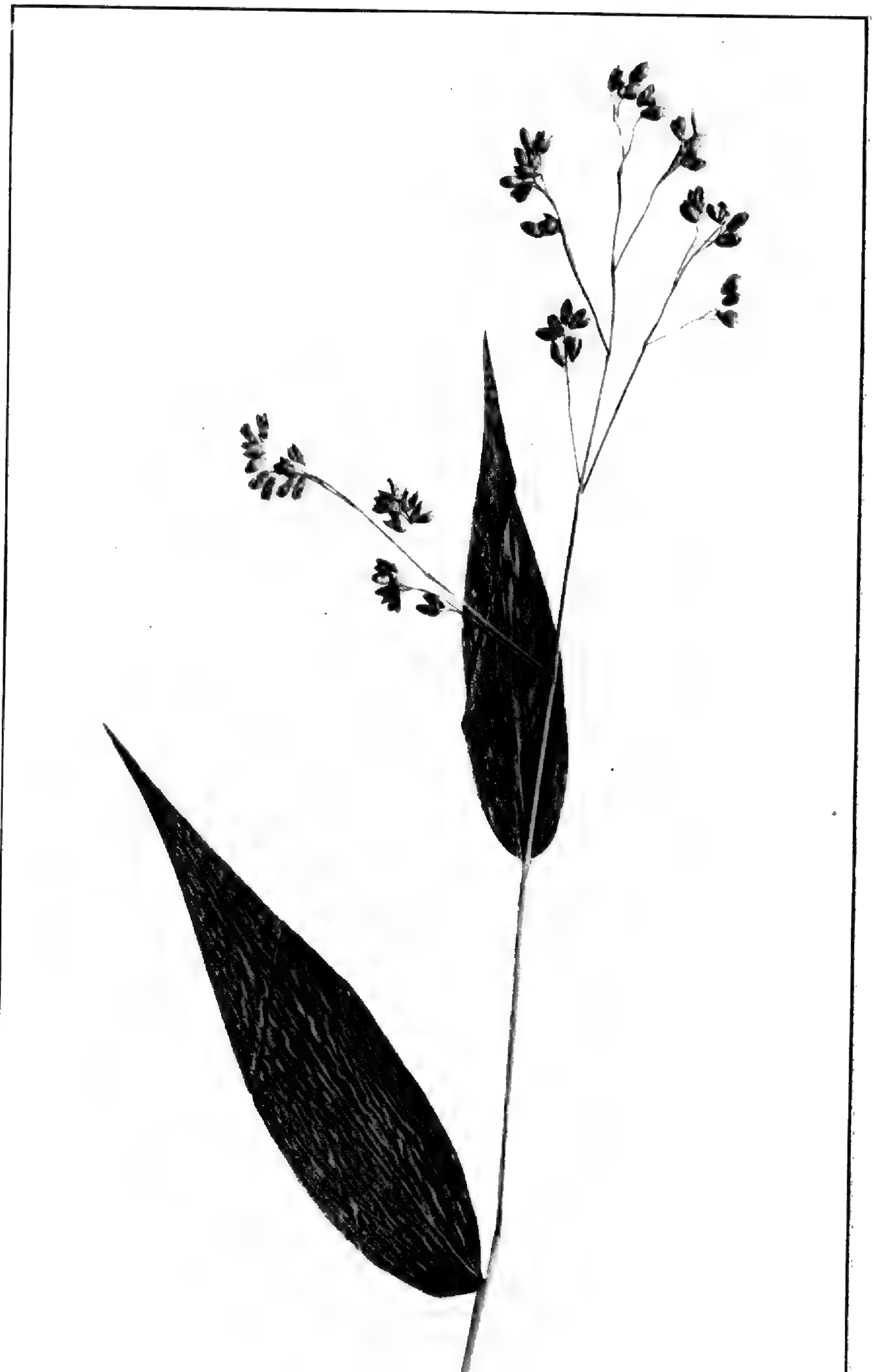
LASIACIS PROCERRIMA (HACK.) HITCHC.

LASIACIS RUGELII (GRISEB.) HITCHC.

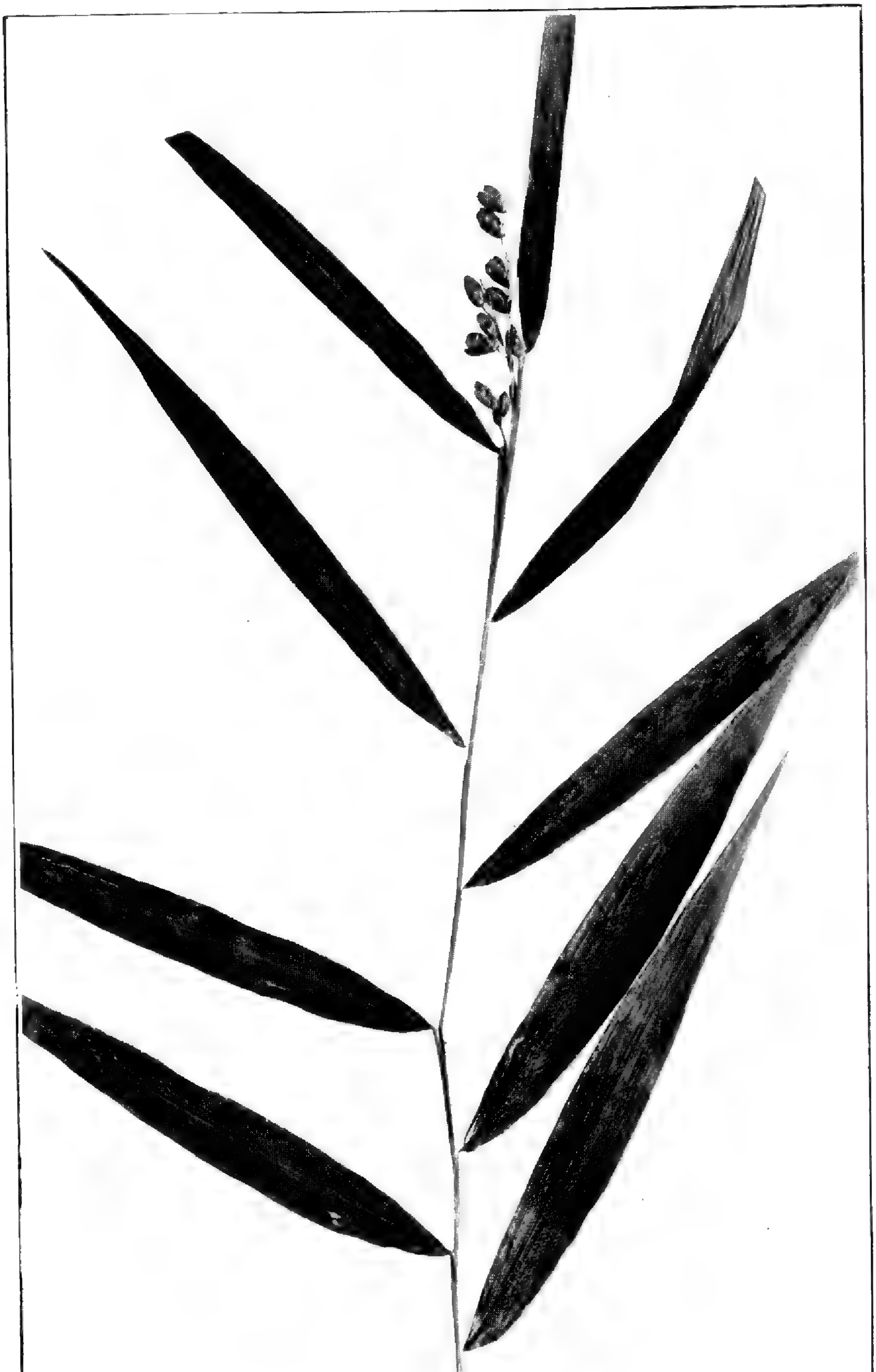
LASIACIS GRISEBACHII (NASH) HITCHC.

LASIACIS OAXACENSIS (STEUD.) HITCHC.

LASIACIS LIGULATA HITCHC. & CHASE.

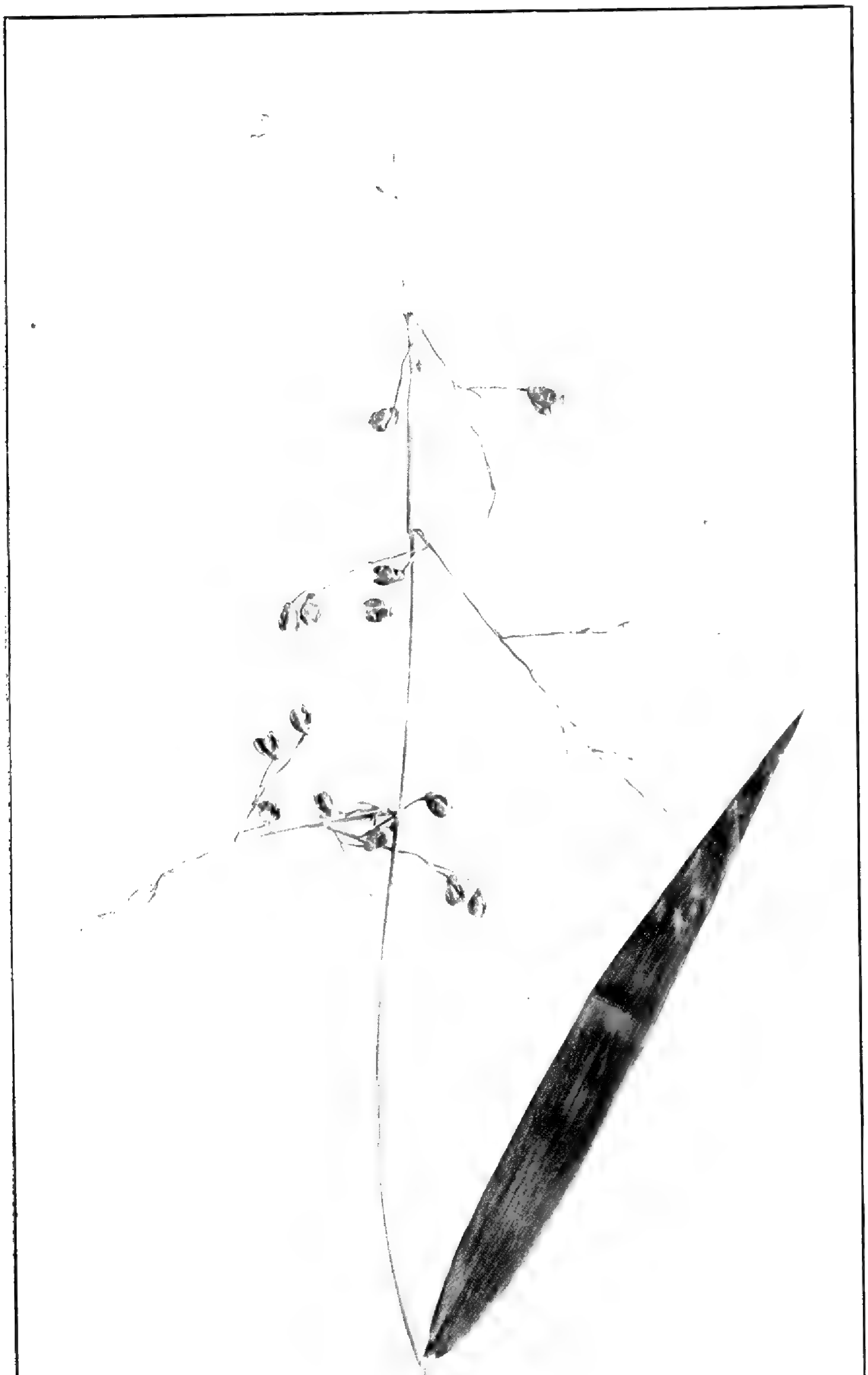


LASIACIS RHIZOPHORA (FOURN.) HITCHC.

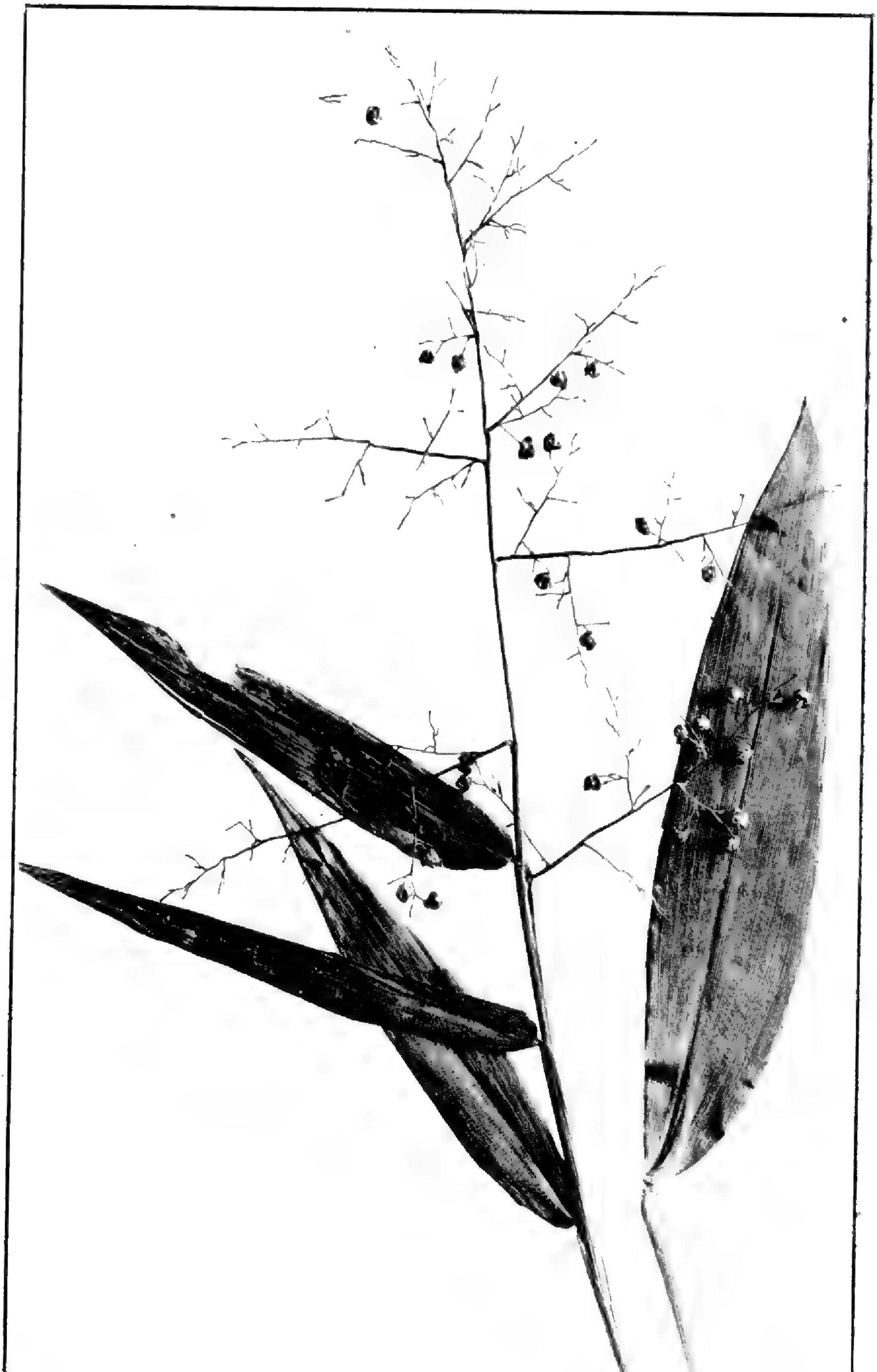


LASIACIS LEPTOSTACHYA HITCHC.

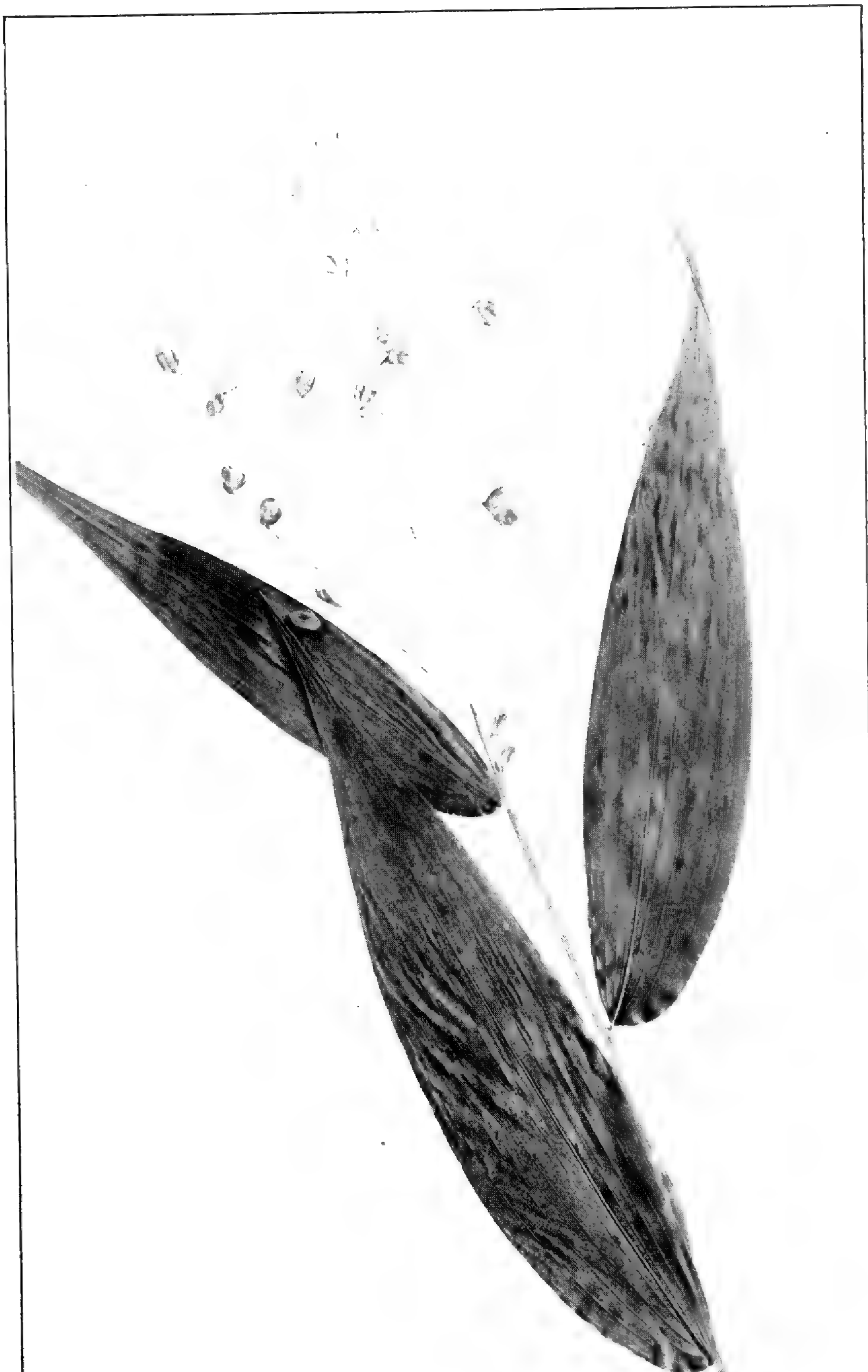
LASIACIS HARRISII NASH.



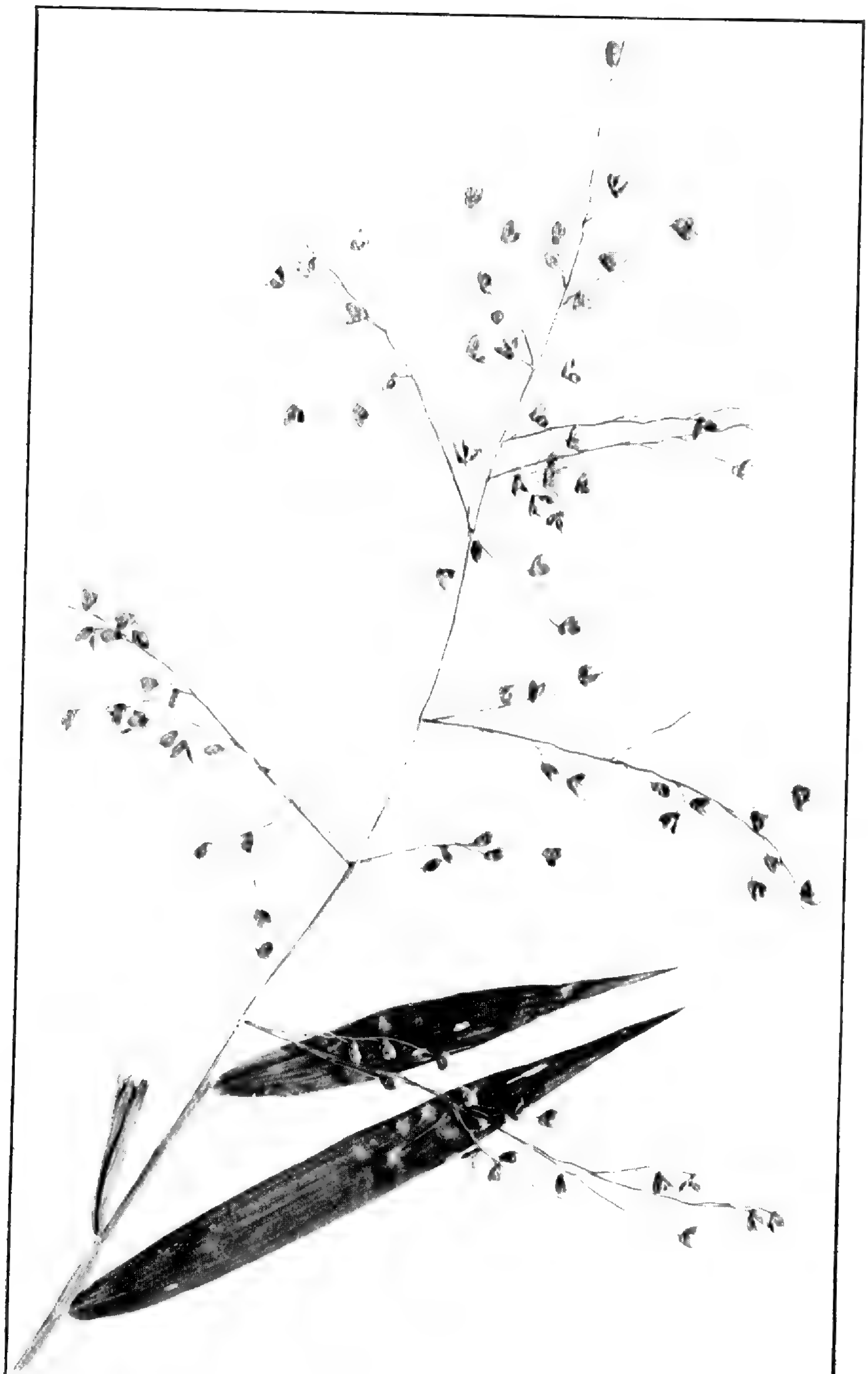
LASIACIS DIVARICATA (L.) HITCHC.



LASIACIS GLOBOSA HITCHC.



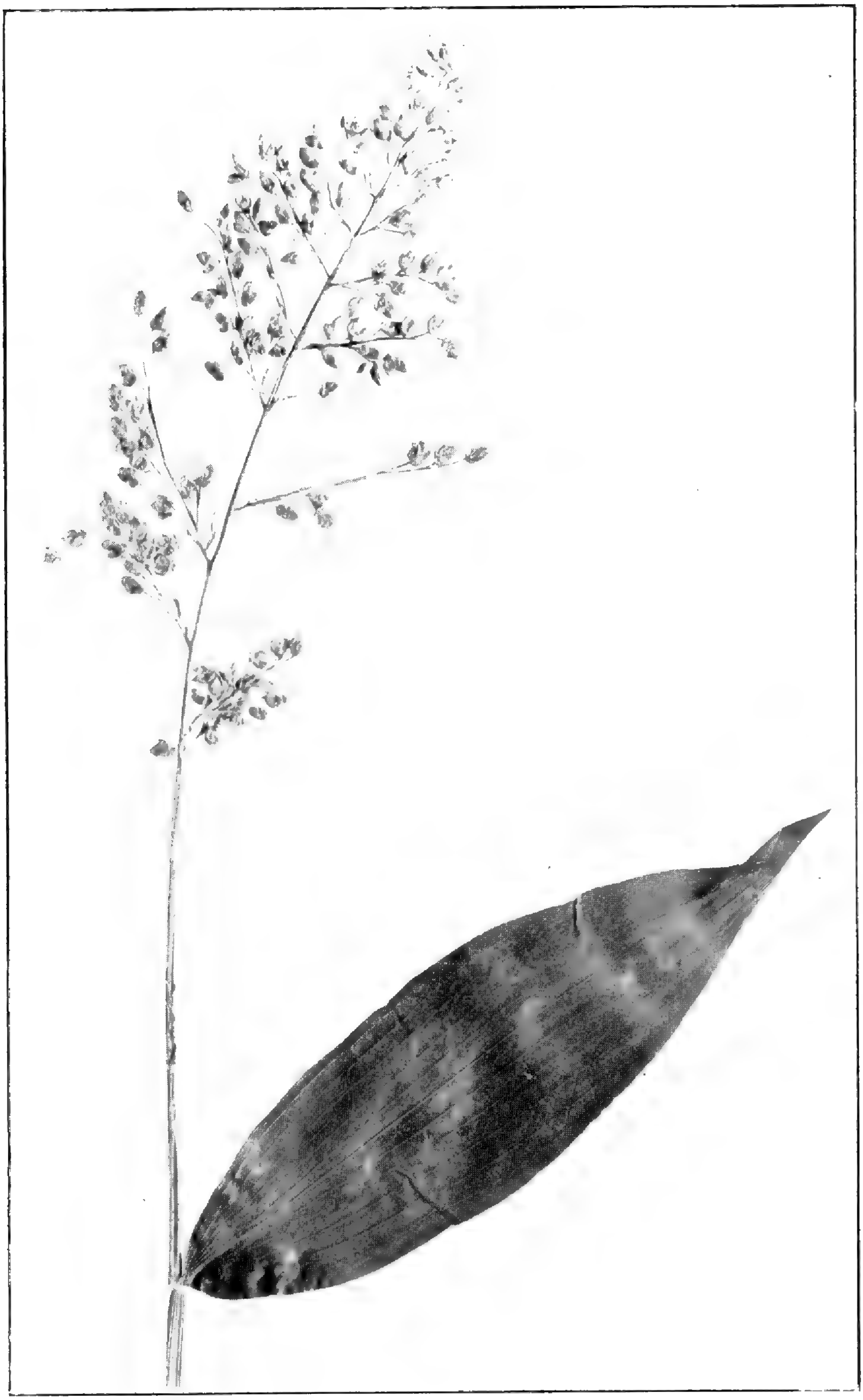
LASIACIS SLOANEI (GRISEB.) HITCHC.



LASIACIS PATENTIFLORA HITCHC. & CHASE.

LASIACIS SORGHOIDEA (DESV.) HITCHC. & CHASE.

LASIACIS RUSCIFOLIA (H. B. K.) HITCHC.



LASIACIS ANOMALA HITCHC.

THE NORTH AMERICAN SPECIES OF BRACHIARIA.

By Agnes Chase.

INTRODUCTION.

The group of grasses here discussed was until recent years commonly included in the genus *Panicum*. Although the genus *Brachiaria* was proposed in 1853, it was not accepted as valid until 1901. This is because its most distinctive character was overlooked—that of reversed spikelets (that is, spikelets with the back of the fertile lemma turned away from the axis instead of toward it, as in *Paspalum* and in the few species of *Panicum* having racemose inflorescence). As a section of *Panicum*, *Brachiaria* had been made to include a number of heterogeneous species, now referred to five distinct genera, on the one common character of racemose inflorescence.

From *Eriochloa* and *Axonopus*, in which also the spikelets are reversed, *Brachiaria* differs in having a well-developed first glume. From the first it differs also in the unspecialized lower rachilla joint, which in *Eriochloa* is enlarged, and from the second in the turgid spikelets and the racemose instead of digitate arrangement of the racemes.

Brachiaria is one of the few genera of Paniceae which belong chiefly to the Old World.

The text figures, drawn by the author, illustrate part of the inflorescence, one-half natural size, and two views of the spikelet and one of the fruit, magnified 10 diameters. In each case the specimen from which the drawing was made is indicated.

HISTORY OF THE GENUS.

The genus *Brachiaria* Griseb.[1] is based on "*Panicum* sect. *Brachiaria* Trin.," and a single species, *B. eruca*eformis (J. E. Smith) Griseb., is included. Grisebach cites, not the first work[2] in which Trinius proposes the section *Brachiaria*, but a later work, Panicearum Genera,[3] in which Trinius includes a somewhat different group of species from those included in his first work. In

[1] In Ledeb. Fl. Ross. **4**: 469. 1853.

[2] Gram. Pan. 51, 125. 1826.

[3] Mém. Acad. St. Pétersb. VI Sci. Nat. **3**[2]: 194. 1834.

De Graminibus Paniceis, Trinius divides *Panicum* into six sections: *a*, DIGITARIA (*Syntherisma*); *b*, PASPALUM; *c*, BRACHIARIA; *d*, ORTHOPOGON (*Oplismenus*); *e*, JUBARIA (*Chaetochloa*, *Pennisetum*, *Hymenachne*, *Valota*, and various other genera of Paniceae having plumelike panicles); and *f*, MILIARIA (*Anthaenantia*, *Tricholaena*, and species from other genera). The sections are all artificial, *Brachiaria* especially so, including, as it does, species of *Paspalum*, *Panicum*, *Thrasya*, and *Echinochloa*, the common character of the assemblage being the simple racemes. Four species having reversed spikelets are included, *Panicum falciferum* Trin., *P. polyphyllum* R. Br., *P. glumare* Trin., and "*P. granulare* LaM.," the last included as a variety under "*Panicum brizoides* Retz." (*P. punctatum* Burm.).

In Panicearum Genera, the work which Grisebach cites, the species with a single raceme (*Paspalum decumbens* and species of *Thrasya*) are placed in the new section *Harpostachys*, leaving the remainder under *Brachiaria*, an assemblage scarcely less heterogeneous than before. Two more species with reversed spikelets, *Panicum isachne* Roth (*P. erucaeforme* J. E. Smith) and *P. plantagineum* Link, are added, but the reversed position is not mentioned, nor are these six species grouped together. Since there is nothing in either work to indicate which species should be considered the type of *Brachiaria*, it seems best to follow Grisebach and take as the type *B. erucaeformis*. Grisebach, however, did not intentionally select this species as the basis of the genus; it was the only species of Trinius's section which occurred in the Russian Empire, the grasses of which he was describing. Grisebach does not mention the reversed spikelets. This character, first noted as generic by Nash [1] ("flowering scale with its opening toward the rachis"), confines the genus to *B. erucaeformis* and its allies. The genus so limited is somewhat diverse, but taken as a whole the morphological resemblances of the species segregated on the combined characters of racemose inflorescence and reversed position of solitary subsessile spikelets having a well-developed first glume indicate a fairly natural genus, the extremes being united by a series of intermediate species.[2]

Like several other genera of Paniceae, *Brachiaria* includes species that appear to be closely related to outlying species of *Panicum*. *Panicum helopus* Trin., from the Mascarenes, has solitary spikelets in strict racemes, and papillose-rugose, awn-tipped fruit as in *B. meziana* and other species of *Brachiaria*, but the spikelets are placed as in *Panicum fasciculatum* and its allies. *Urochloa panicoides* Beauv., from Mauritius, is, judging from the poor illustration and in-

[1] In Small, Fl. Southeast. U. S. 50, 80. 1903.

[2] For further history of *Brachiaria* as section and genus, see Chase, Proc. Biol. Soc. Washington **24**: 126–129. 1911.

adequate description, closely related to *P. helopus*, and approaches *Brachiaria* in the same way.

Our species represent nearly the extremes of diversity in the genus, with *B. erucaeformis*, the type but not the center of the genus, at one end, and *B. ciliatissima* at the other. The species most nearly related to the latter is **B. gilesii** (*Panicum gilesii* Benth.),[1] of Australia, of which a specimen of the type collection by C. Giles at Charlotte Waters is in the National Herbarium.

In the tropics or subtropics of the eastern hemisphere there are about 70 known species, a single one, *B. erucaeformis*, reaching southern Europe, there probably introduced in ancient times. In America are the six species described herewith. In Africa is a small group in which the spikelets are crowded and almost pectinate on the rachis. This includes *B. brizantha* (Hochst.) Stapf, the type collection of which (*Schimper*, Iter Abyssinicum no. 89, October 3, 1837) is represented in the National Herbarium, *B. falcifera* (Trin.) Stapf, *B. soluta* Stapf, and *B. decumbens* Stapf.[2]

Brachiaria miliiformis (*Panicum miliiforme* Presl[3] the type of which, collected by Haenke in Luzón, was examined in the National Museum at Prague by Prof. A. S. Hitchcock in 1907) is apparently a common grass in the Philippines and has been distributed thence under various names. It is represented in the National Herbarium by the following: *Merrill* 332, 352, 9343, in Kneucker Gram. Exs. 610; *Elmer* 10414; *Loher* 1737; *Bur. Science* 7624, 12231; *Forestry Bur.* 16661. It was collected in Guam by J. B. Thompson (no. 263).

Other species referable to *Brachiaria*, but which, because of the impossibility at present of examining the type specimens in European herbaria and working up the synonymy, are not here transferred, are: *Panicum intercedens* Domin, *P. reversum* Muell., and *P. polyphyllum* R. Br., of Australia; *P. villosum* Lam. and *P. distachyon* L., of India; and *P. ambiguum* Trin., of the East Indies. Various species of true *Panicum* as well as *P. ambiguum* have been distributed under the last named. In this species the spikelets are paired or solitary, the first glume is nearly as long as the spikelet, and the fruit is awn-tipped.

DESCRIPTION OF THE GENUS AND SPECIES.

BRACHIARIA (Trin.) Griseb.

Inflorescence of several to many usually dense racemes along a common axis; spikelets solitary (rarely in pairs), subsessile in 2 rows on one side of a 3-angled, sometimes narrowly winged rachis, the back of the fertile

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[1] Fl. Austral. 7: 477. 1878.

[2] Stapf (in Prain, Fl. Trop. Africa 9: 505–567. 1919) describes 55 species of *Brachiaria*, indicating that the species of this genus are chiefly African.

[3] Rel. Haenk. 1: 300. 1830.

lemma turned from the axis; spikelets dorsally compressed, sometimes turgid; first glume well developed; second glume and sterile lemma equal or nearly so, 5 to 7-nerved, the lemma inclosing a hyaline palea and sometimes a staminate flower; fruit indurate (in the type species smooth and shining), usually papillose-rugose, the lemma usually apiculate or awn-tipped, the margins inrolled.

Annuals or perennials with usually flat blades, the culms often decumbent and rooting at the lower nodes; confined to the warmer temperate and tropical regions of both hemispheres.

KEY TO THE SPECIES.

Spikelets pubescent.
- Plants annual; spikelets 2.5 mm. long, the pubescence about evenly distributed . . . . . **1. B. erucaeformis.**
- Plants perennial; spikelets 3.5 to 4.5 mm. long, the pubescence conspicuously uneven.
  - Fruit with a pubescent awn about 1 mm. long . . . **2. B. ophryodes.**
  - Fruit awnless . . . . . **3. B. ciliatissima.**

Spikelets glabrous.
- Plants perennial; spikelets about 3 mm. long; fruit awn-tipped. **4. B. meziana.**
- Plants annual; spikelets 4 mm. long or more; fruit awnless.
  - Rachis 1 to 1.5 mm. wide; spikelets about 4.5 mm. long, not turgid, nor flat-beaked beyond the fruit. . . . . **6. B. plantaginea.**
  - Rachis 2 mm. wide; spikelets about 4 mm. long, turgid, flat-beaked beyond the fruit . . . . . **5. B. platyphylla.**

1. Brachiaria erucaeformis (J. E. Smith) Griseb.

Panicum erucaeforme J. E. Smith in Sibth. Fl. Graec. **1**: 44. *pl. 59*. 1806. "In arvis circa Junonis templum in insula Samo." The plate leaves no doubt as to the identity of the species.

Panicum isachne Roth in Roem. & Schult. Syst. Veg. **2**: 458. 1817. "In India orient. Heyne." The type specimen has not been examined, but the description identifies the species.

Panicum caucasicum Trin. Gram. Icon. **3**: *pl. 262*. 1831. "Figura ad specimen e Caucaso orientali." The plate identifies the species.

Panicum wightii Nees, Fl. Afr. Austr. 29. 1841. "In graminosis vallis ad Gekau. . . . (Drège)." Two unpublished names based on East Indian collections are cited as synonyms, "*Panicum wightianum* W.-Arn. et N. ab E. Glum. Ind. or. ined.," and "*Panicum Koenigii* Herb. Wight n. 14"; but since it is to be assumed that Nees drew up his description for the African flora from the Drège specimen, this is taken as the type. The description indicates a small specimen.

Echinochloa erucaeformis Koch, Linnaea **21**: 437. 1848. Based on *Panicum erucaeforme*.

Panicum pubinode Hochst.; A. Rich. Tent. Fl. Abyss. **2**: 363. 1851. "In pl. Schimp. Abyss., sect. III. no. 1855 . . . Crescit in convalle fluvii Tacazzé . . . (Schimper)." The spikelets are described as purple-tinged. It is on this color difference that the author distinguishes it from *P. erucaeforme*.

Brachiaria erucaeformis Griseb. in Ledeb. Fl. Ross. **4**: 469. 1853. Based on *Panicum erucaeforme* J. E. Smith.

Panicum isachne var. *mexicana* Beal, Grasses N. Amer. **2**: 114. 1896. "Specimen seen was cultivated from seed obtained in Mexico by U. S. Dept. Agricul., 1887." Beal gives "P. eruciforme Sibth. . . . var. mexicana Vasey, ined."

as a synonym. In the National Herbarium is a specimen of *B. erucaeformis* bearing in Dr. Vasey's hand the note "Closely related to *P. erucaeforme*. Panicum new species. Cultivated by G. Vasey from Mexican seed, of Dr. Ed. Palmer, 1887." The species is not known from Mexico. It is probable that the plants came up as weeds where seed of some Mexican grass was sown and, samples of such seed not having been preserved, the fact that this was not the species planted was not detected.

Roemer and Schultes,[1] doubtless by a typographical error, give the name as "*cruciforme*" instead of "*erucaeforme*" (like *Eruca*), an error which is copied in many later works.

DESCRIPTION.

Plants annual, stoloniferous, extensively creeping, the slender ascending flowering shoots 20 to 50 cm. tall, branching; culms glabrous, commonly grooved when dry, the nodes densely pubescent; sheaths and both surfaces of the blades usually sparsely tuberculate-hirsute (or the blades glabrate), densely puberulent at the junction of sheath and blade; ligule a ring of hairs about 1 mm. long; blades flat, 1.5 to 10 cm. (mostly 2 to 6 cm.) long, 2 to 6 mm. wide, rounded at the base; panicle long-exserted, 2 to 10 cm. long, the 5 to 12 racemes erect-falcate, imbricate, or the lower distant their own length, the common axis and the rachises very slender, angled, the axis scabrous or sparsely pilose, the rachises and minute pedicels pilose; spikelets loosely imbricate, ovate-oblong, about 2.5 mm. long; first glume minute, truncate or notched, glabrous; second glume and sterile lemma about equal, 5-nerved, papillose-pilose, rather obtuse, but the summits commonly folding in, forming a point beyond the fruit; fertile lemma and palea about 1.8 mm. long and 0.9 mm. wide, pale, smooth, and shining, the 3 nerves of the lemma faintly visible.

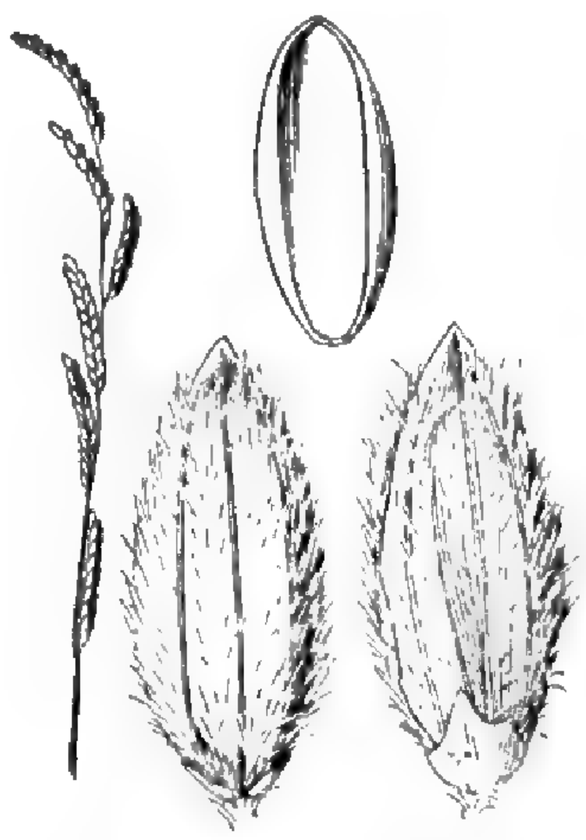

FIG. 1.—*Brachiaria erucaeformis*. From a cultivated specimen, U. S. Nat. Herb. 928637.

In dry ground the plants form small tufts of suberect culms, a habit rarely seen in Old World specimens.

DISTRIBUTION.

Along ditches and in cultivated ground, mostly in arid regions, from Central India west to Spain, and in eastern and southern Africa; in the United States known only from specimens cultivated in the grass garden of the Department of Agriculture at Washington, D. C., and at Arlington, Virginia, and persisting for a short time as weeds, and from specimens grown at Pullman, Washington, and Biloxi, Mississippi. Sparingly introduced in Barbados, West Indies, and in the island of Guam.

2. **Brachiaria ophryodes** Chase, sp. nov.

Plants perennial, grayish green, 15 to 25 cm. tall; culms at first more or less erect, becoming decumbent, freely branching and rooting at the lower nodes, compressed, villous, or becoming glabrate above; sheaths mostly longer than the internodes, somewhat keeled, villous; ligule membranaceous, ciliate, 0.5 mm. long; blades flat, rather thick, 5 to 20 cm. long, 3 to 6 mm. wide, nearly linear

[1] Syst. Veg. 2: 426. 1817.

(or the uppermost shorter and lanceolate, and the basal ones as much as 15 cm. long), acuminate, the white cartilaginous undulate margin scabrous and, toward the rounded base, papillose-ciliate, more or less papillose-hispid on both surfaces; primary panicles long-exerted, the secondary panicles short-exserted or included at base, the common axis and rachises slender, angled, scabrous, the rachises villous at base; racemes 2 to 4, nearly erect, 3 to 4 cm. long, the short, thick pedicels bearing a few long white hairs; spikelets approximate, 4 mm. long, 2 mm. wide, with a dense, silky-villous, or furlike band down each side; first glume half as long as the spikelet, acuminate, villous below, the tip glabrous; second glume and sterile lemma equal, pointed beyond the body of the fruit, the glume villous except at the summit, bearing at each side of the principal lateral nerves a very dense band of ascending pale silky glistening hairs increasingly longer toward the summit, the 2 bands divided by the hidden nerve, or the inner band sometimes wanting, the bands abruptly terminating about one-fourth below the summit; sterile lemma inclosing a long palea and sometimes a staminate flower, 5 to 7-nerved, the third pair of nerves almost marginal, the lateral internerves and margins villous, the second or lateral pair of nerves bearing on the outer side a single band of dense hairs like those of the second glume; fruit about 2.5 mm. long (excluding the awn), 1.5 mm. wide, stramineous, transversely rugose, the lemma tipped with a puberulent awn sometimes nearly 1 mm. long.

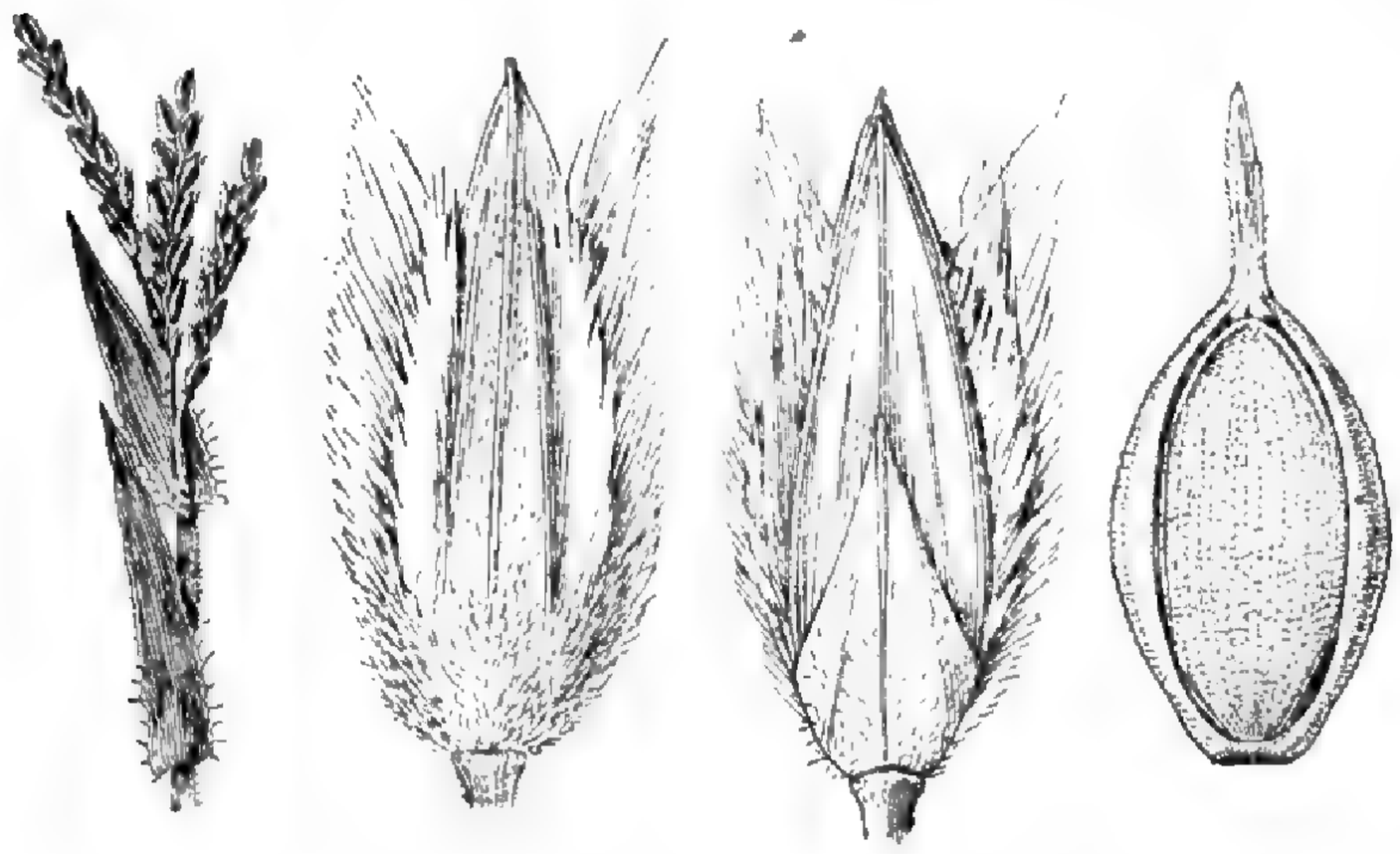

FIG. 2.—*Brachiaria ophryodes*. From the type specimen.

Type in the U. S. National Herbarium, no. 693324, collected along an irrigation ditch in loamy soil, at Monterrey, Nuevo León, Mexico, July 6, 1910, by A. S. Hitchcock (no. 5538). Known only from the type collection.

Brachiaria ophryodes is allied to *B. ciliatissima*, from which it differs in the stouter and pubescent culms, in the more densely flowered racemes, in the abrupt termination below the summit of the spikelet of the band of glistening, silky hairs, and in the awn-tipped lemma.

3. Brachiaria ciliatissima (Buckl.) Chase.

Panicum ciliatissimum Buckl. Prel. Rep. Geol. Agr. Surv. Tex. App. 4. 1866. "Northern Texas." The type specimen is in the herbarium of the Academy of Natural Sciences, Philadelphia. No locality other than Texas is given on the label.

DESCRIPTION.

Plants perennial, producing long leafy stolons, with short internodes, rooting at the swollen nodes, the blades short, firm, divaricately spreading; flowering culms usually sparingly branching, erect or ascending, 15 to 40 cm. high, glabrous, the nodes bearded; sheaths sparsely (or sometimes rather densely) pilose, mostly shorter than the internodes; ligules densely hairy, less than 1 mm. long; blades 3 to 7 cm. long, 3 to 5 mm. wide, tapering from near the

rounded base to a sharp point, flat, puberulent or glabrous, usually ciliate along the lower part of the thick white margin; panicles finally long-exserted, 3 to 6 cm. long, rarely over 1 cm. wide, the common axis and rachises slender, angled, pubescent, the few branches erect or ascending, not strict racemes with spikelets regularly arranged as in the other species, 1 to 2 cm. long, sometimes reduced to 1 or 2 spikelets; spikelets mostly distant about their own length, 4 mm. long, about 1.8 mm. wide, pointed; first glume three-fourths the length of the spikelet or more, cuneate, 5-nerved, glabrous, or with a few silky hairs at the very base; second glume and sterile lemma subequal, exceeding the fruit, 5-nerved, the internerves densely silky pubescent, or in the lemma sometimes nearly glabrous, the portion from the lateral nerves to the margins densely clothed with glistening white silky hairs; fruit 3 mm. long, about 1.6 mm. wide, ellipsoid, apiculate, transversely rugose.

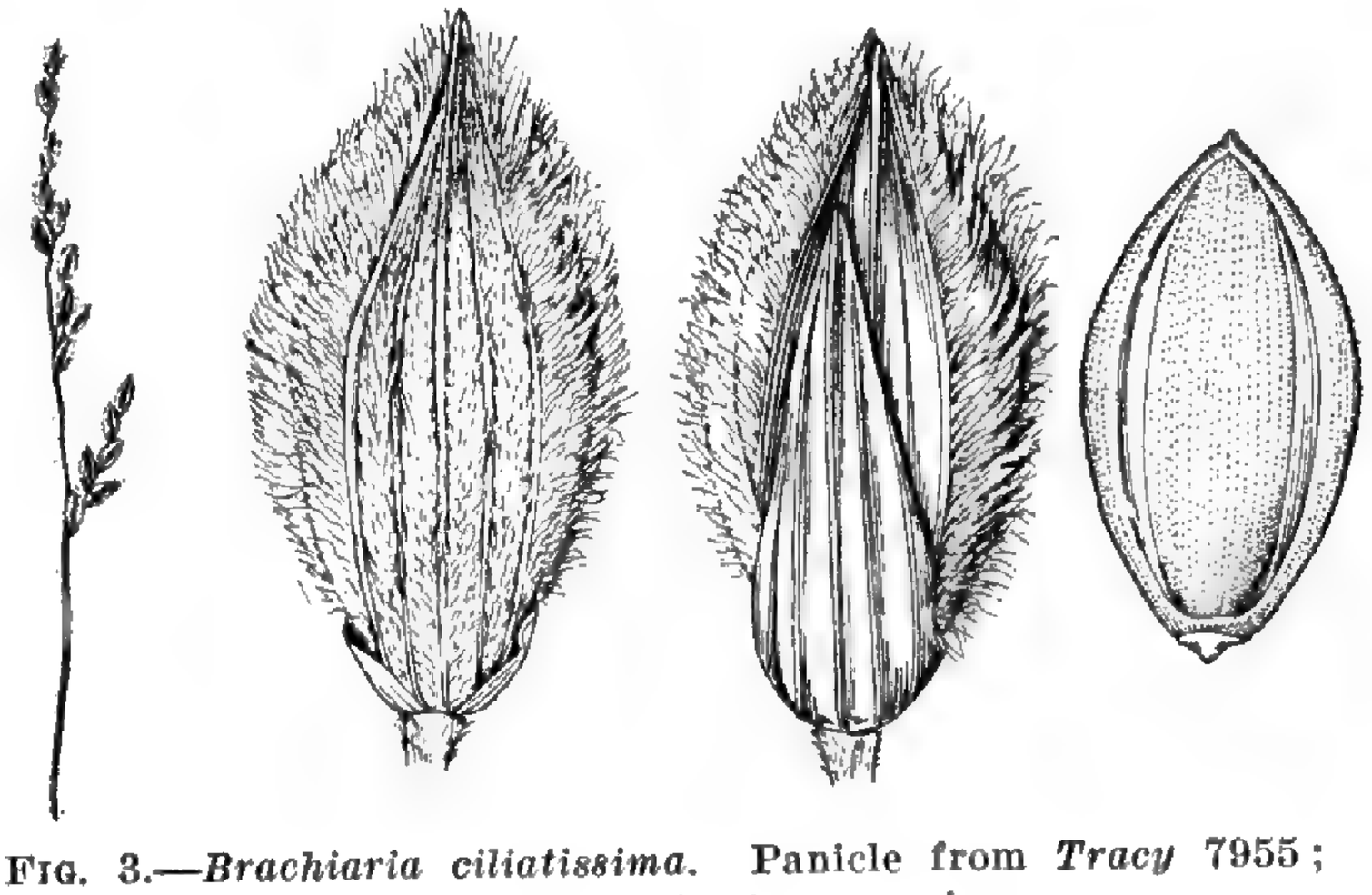

FIG. 3.—*Brachiaria ciliatissima*. Panicle from *Tracy* 7955; spikelet from the type specimen.

The reversed position of the spikelets places this species more naturally in *Brachiaria* than in *Panicum*. Moreover, *B. ophryodes* is obviously a connecting link between this species and *B. meziana*.

DISTRIBUTION.

Open sandy ground, Arkansas and Texas.

ARKANSAS: Benton County, *Plank* 8.

TEXAS: Kerrville, *Hitchcock* 5320. Austin, *Hall* 824. College Station, *Hitchcock* in 1903. Abilene, *Tracy* 7955. San Antonio, *Amer. Gr. Nat. Herb.* 200. Kingsville, *Piper* in 1906. Rockport, *Chase* 6063. San Diego, *Smith* in 1897. Corpus Christi, *Hitchcock* 5348. Sarita, *Hitchcock* 5448. Pena, *Nealley* 31. Encinal, *Griffiths* 6381. Elsordo, *Griffiths* 6441, 6445. Torrecillas, *Griffiths* 6432. Laredo, *Hitchcock* 5515; *Reverchon* 4150. Big Spring, *Hitchcock* 13358. Western Texas, *Buckley* in 1883.

4. Brachiaria meziana Hitchc.

Brachiaria meziana Hitchc. Contr. U. S. Nat. Herb. 12: 140. 1908. "The type specimen is no. 156925 of the U. S. National Herbarium (Pringle's 9592)." This specimen was collected in the Cerro de Guadalupe, Federal District, Mexico, altitude 2,250 meters, August 19, 1901.

DESCRIPTION.

Plants perennial, cespitose; culms flattened, glabrous or sparsely pilose, 15 to 40 cm. tall, at first erect or ascending and simple, later repeatedly branching and decumbent-spreading, sometimes as much as 70 cm. long, often rooting at the nodes; sheaths loose, pilose, or sometimes glabrate, densely ciliate on the

margin; ligule a ring of hairs about 1 mm. long; blades rather thick, 5 to 15 cm. long (rarely longer), 5 to 10 mm. wide, flat, rounded at the base, papillose-ciliate on the margins toward the base, sparsely pilose or nearly glabrous on both surfaces; primary panicles long-exserted, those of the branches short-exserted or included at the base, the common axis rather stout, angled, pilose; racemes mostly 5 to 10, usually approximate, 1.5 to 4.5 cm. long, the lower usually naked at the base; spikelets crowded, glabrous, 3 mm. long, about 1.8 mm. wide, ovate, abruptly acute, turgid, the minute pedicels long-pilose; first glume one-third to scarcely half the length of the spikelet, broad, acute or subacute, 3-nerved; second glume and sterile lemma equal, 5-nerved; fruit 2.5 to 2.6 mm. long (excluding the awn), about 1.5 mm. wide, papillose-roughened, the lemma tipped with an awn about 0.5 mm. long.

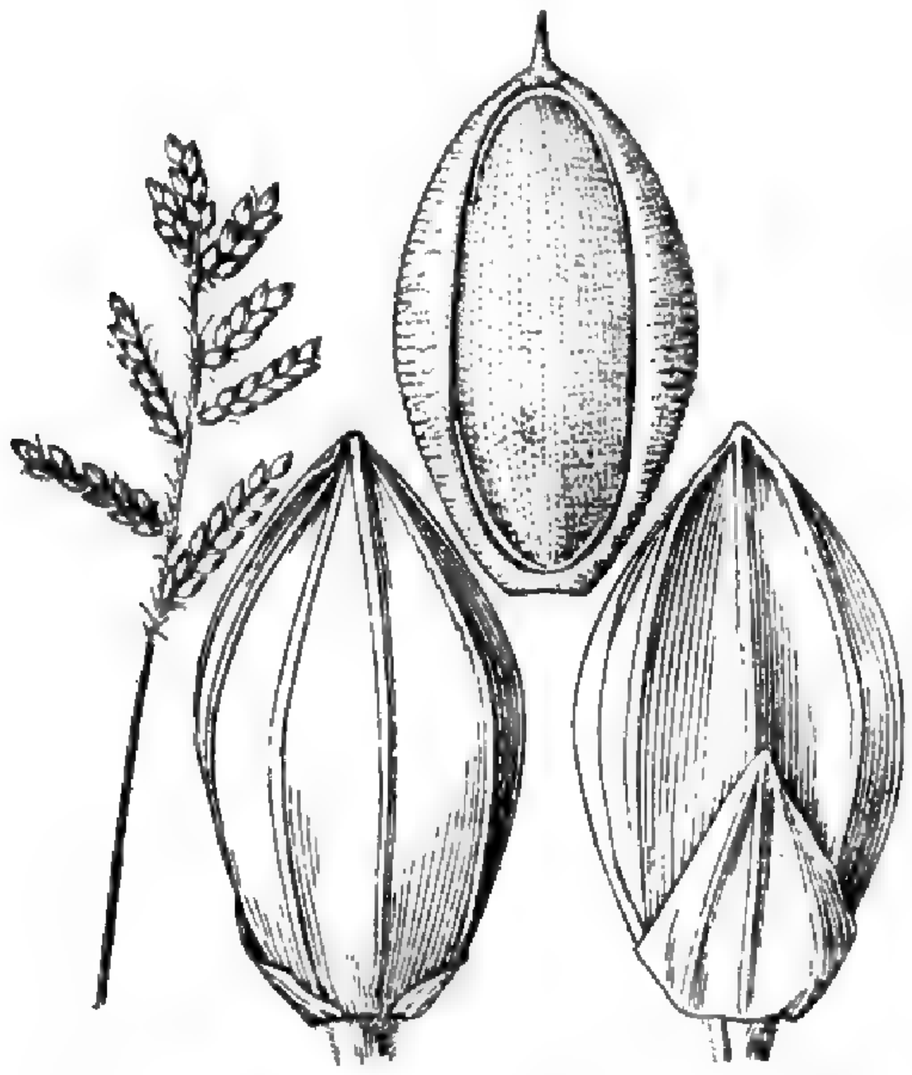

FIG. 4.—*Brachiaria meziana*. From the type specimen.

DISTRIBUTION.

Low moist open ground on the uplands of Mexico.

CHIHUAHUA: Chihuahua, *Pringle* 375.
COAHUILA: Saltillo, *Hitchcock* 5593.
DURANGO: Durango, *Hitchcock* 7619; *Palmer* 533 in 1896.
SAN LUIS POTOSI: San Luis Potosí, *Hitchcock* 5668. Cárdenas, *Hitchcock* 5770.
QUERÉTARO: Querétaro, *Hitchcock* 5802; *Agniel* 10262.
ZACATECAS: Zacatecas, *Hitchcock* 7516.
AGUASCALIENTES: Aguascallentes, *Hitchcock* 7492.
JALISCO: San Nicolás, *Hitchcock* 7225. Río Blanco, *Palmer* 254 in 1886.
PUEBLO: Atlixco, *Nelson* in 1893; Puebla, *Arsène* 315, 493.
FEDERAL DISTRICT: *Hitchcock* 5891; *Pringle* 9592; *Bourgeau* 222, 439; *Orcutt* 3692.
GUANAJUATO: Acámbaro, *Hitchcock* 6928. Irapuato, *Hitchcock* 7416.
OAXACA: Oaxaca, *Conzatti & González* 348.

5. Brachiaria platyphylla (Griseb.) Nash.

Paspalum platyphyllum Griseb. Cat. Pl. Cub. 230. 1866. "Cuba occ. (Wr[ight] 3441), in humidis pr. Zarabanda (Wr. a. 1865)." The type specimen in the Grisebach Herbarium consists of two plants, each with two racemes.

Panicum platyphyllum Munro; Wright, Anal. Acad. Cienc. Habana 8: 206. 1871. Based on *Paspalum platyphyllum* Griseb.

Brachiara platyphylla Nash in Small, Fl. Southeast. U. S. 81, 1327. 1903. Based on "*Panicum platyphyllum* Munro."

DESCRIPTION.

Plants annual, rather coarse; culms compressed, glabrous, decumbent at the base, rooting and commonly branching at the lower nodes, the flowering branches ascending, sparingly branching from the lower nodes; sheaths rather loose, sparsely pilose, at least along the margins and toward the summit; ligule a ring of hairs scarcely 1 mm. long; blades rather thick, 4 to 12 cm. long (rarely longer), 6 to 12 mm. (usually about 10 mm.) wide, flat, glabrous ex-

cept near the margins at the rounded base, scabrous on the white marginal nerve; panicle short-exserted or included at base, the common axis flat; racemes 2 to 6, commonly distant nearly or quite their own length, 3 to 8 cm. long or the lowermost 9 cm. long, ascending or spreading, often arcuate; rachis villous at the very base, winged, 2 mm. wide, scabrous on the slightly upturned margin; spikelets usually barely imbricate, ovate, glabrous, 4 to 4.5 mm. long, about 2 mm. wide, the lower two-thirds turgid, flattened toward the summit; first glume scarcely one-third the length of the spikelet, broad, blunt, 3 to 5-nerved; second glume and sterile lemma equal, exceeding the fruit and forming a flat beak beyond it, 3 to 5-nerved, with faint transverse wrinkles between the nerves toward the summit; fruit 3 mm. long, 1.7 to 1.8 mm. wide, elliptic, turgid, papillose-roughened.

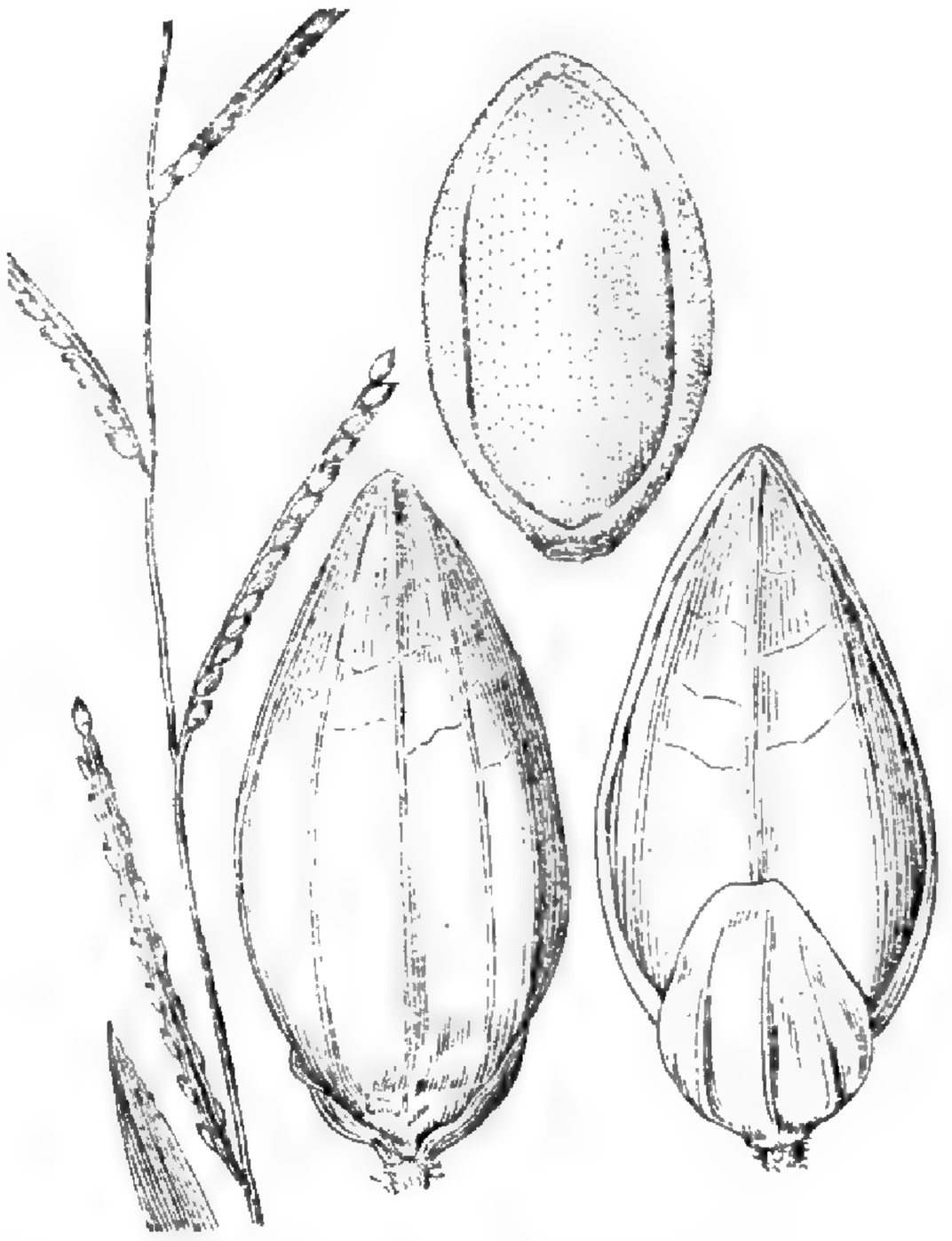

FIG. 5.—*Brachiaria platyphylla*. Part of panicle from *León* 4848; spikelet from the type specimen.

DISTRIBUTION.

Low sandy open ground, southern Louisiana and Texas and in western Cuba.

LOUISIANA: Shreveport, *Ball* 91; *Hitchcock* in 1903.

TEXAS: Houston, *Hall* 814; *Nealley* 70. College Station, *Reverchon* 1879; *Hitchcock* in 1903. Harvester, *Thurow* in 1898. Ennis, *Smith* in 1897. Jacksonville, *Joor* 25. Harris County, *Joor* 16.

CUBA: Pinar del Río, *Wright* 3441, 3853, 3867. San Diego de los Baños, *León* 4522, 4848. Sumidero, *Shafer* 13850; *Shafer & León* 13637, 13724 (also distributed under the same numbers as *León & Shafer*).

6. Brachiaria plantaginea (Link) Hitchc.

Panicum plantagineum Link, Hort. Berol. 1: 206. 1827. Described from a specimen grown in the Berlin Botanical Garden, the habitat given as unknown. In the Link Herbarium, in the herbarium of the Berlin Botanical Garden, is a specimen labeled "*Panicum plantagineum* Link, Lk. Hort 1, p. 206. Brasilia, *Beyrich*." The description does not apply perfectly to this specimen, in that the lower racemes are said to be long-peduncled and the palea of the neuter floret wanting. The racemes in this species are usually spikelet-bearing nearly to the base, but spikelets undeveloped or fallen might give the impression of a peduncle, and the sterile palea, normally present, may sometimes be obsolete. The type may not have been preserved. This is evidently the specimen which was examined by Trinius and which caused him[1] to refer his *P. leandri* to *P. plantagineum* Link.

Panicum leandri Trin. Gram. Icon. 3: *pl. 335*. 1836. "Figura ad specimen Brasilianum," presumably collected by Leandro de Sacramento, a Carmelite friar,

[1] Gram. Icon. 3: Corr. et Emend. *pl. 335*. 1836.

who was stationed at Rio Janeiro and who sent botanical collections to Paris and Munich. The specimen was not found in the Trinius Herbarium, but the plate identifies the species.

Panicum distans Salzm.; Doell in Mart. Fl. Bras. 2^2: 186. 1877. A herbarium name given as a synonym of *Panicum plantagineum.*

Brachiaria plantaginea Hitchc. Contr. U. S. Nat. Herb. **12**: 212. 1909. Based on *Panicum plantagineum* Link.

DESCRIPTION.

Plants resembling *B. platyphylla*, more widely creeping and commonly taller, the sheaths ciliate on the margin, otherwise glabrous or nearly so, the blades with a few hairs on the margins at the narrowed or slightly rounded base, rather lax, mostly 8 to 12 mm. wide, 5 to 20 cm. long, or rarely longer; panicle short-exserted or included at the base, the common axis more slender than in *B. platyphylla*, mostly folded; racemes 3 to 6, or on the branches 1 or 2, 3 to 10 cm. long, rarely longer, ascending or spreading, sometimes flexuous; rachis 1 to

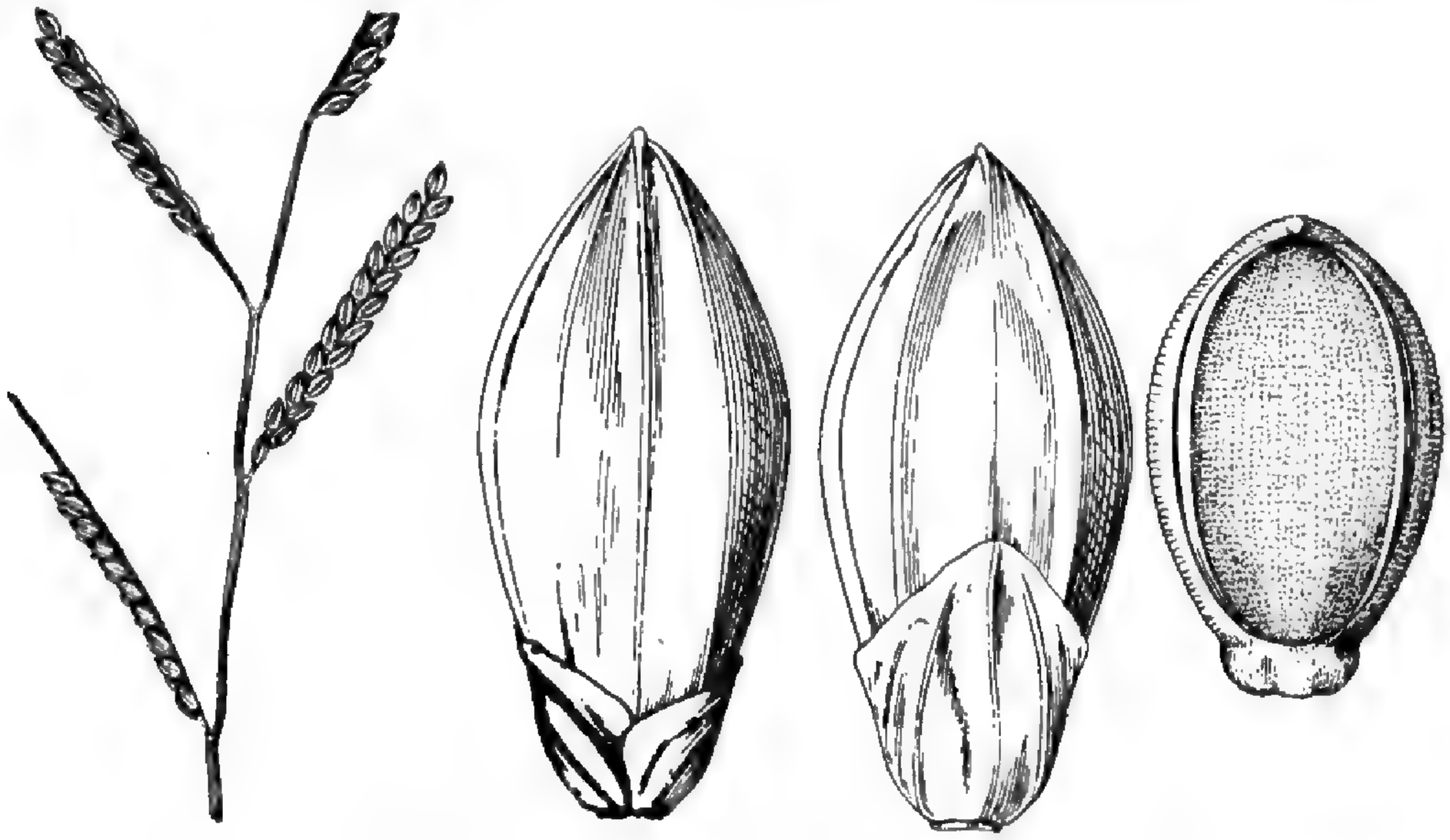

FIG. 6.—*Brachiaria plantaginea.* From *Pringle* 3904.

1.5 mm. wide, usually appearing more slender because of the infolded margins; spikelets glabrous, 4 to 4.7 mm. long, about 2 mm. wide, elliptic, less turgid than in *B. platyphylla*, depressed down the middle of the sterile lemma, this and the second glume not forming a flattened beak beyond the fruit; fruit plano-convex, 3 to 3.5 mm. long, minutely papillose-roughened, the rachilla joints between the glumes and lemmas slightly developed, placing the fruit nearer to the summit of the spikelet.

A species of wider range and more variable than *B. platyphylla.*

DISTRIBUTION.

Open, mostly moist ground, at an altitude of 900 to 2,100 meters in the uplands of Mexico, and south to Bolivia and southern Brazil. In 1879 it appeared in ballast at Philadelphia, Pennsylvania (*Burk*), and Camden, New Jersey (*Martindale*).

DURANGO: Durango, *Hitchcock* 7576; *Palmer* in 1896.

SAN LUIS POTOSÍ: Las Canoas, *Hitchcock* 5758; *Pringle* 3904. Cárdenas, *Hitchcock* 5752.

MORELOS: Cuernavaca, *Hitchcock* 6853; *Orcutt* 3890.
COLIMA: Jala, *Hitchcock* 7010. Colima, *Orcutt* 4616.
AGUASCALIENTES: Aguascalientes, *Hitchcock* 7488.
GUANAJUATO: Irapuato, *Hitchcock* 7410. Acámbaro, *Hitchcock* 6937.
JALISCO: Guadalajara, *Hitchcock* 7320. Zapotlán, *Hitchcock* 7136. San Nicolás, *Hitchcock* 7192.
VERACRUZ: Orizaba, *Hitchcock* 6315. Jalapa, *Hitchcock* 6653. Córdoba, *Hitchcock* 6405.
OAXACA: Oaxaca, *Hitchcock* 6122; *Conzatti & González* 350a.
MICHOACÁN: Uruápan, *Hitchcock* 6990.
GUATEMALA: Guatemala City, *Hitchcock* 9071. San Miguel Uspanlán, *Heyde & Lux* 3556.
SALVADOR: San Salvador, *Hitchcock* 8961.
NICARAGUA: Masaya, *Hitchcock* 8647.
COSTA RICA: San Francisco de Guadalupe, *Pittier* 16124. San José, *Tonduz* 3029, 6943. Alajuelita, *Pittier* 2998. Guadalupe, *Hitchcock* 8457; *Tonduz* 7592. Atenas, *Hitchcock* 8522. Alajuela, *Jiménez* 521.
BRAZIL: Campinas, *Campos Novaes* 1252. Goyaz, *Gardner* 3499. Rio Quebra Anzol, *Dorsett & Popenoe* 161b. Quixada, Ceará, *Löfgren* 3912. Rio Tardo, Rio Grande do Sul, *Jurgens* G46. Locality unknown, *Riedel* 1950; *Glaziou* 3609.
BOLIVIA: Without locality, *Bang* 2588.

EXCLUDED SPECIES.

BRACHIARIA DIGITARIODES (Carpenter) Nash[1]=*Panicum hemitomon* Schult.
BRACHIARIA OBTUSA (H. B. K.) Nash=*Panicum obtusum* H. B. K.
BRACHIARIA PROSTRATA (Lam.) Griseb.=*Panicum reptans* L.

[1] In Britton, Man. 77. 1901. Nash at this time accepted *Brachiaria* as a genus without reference to the reversed spikelets.

THE NORTH AMERICAN SPECIES OF CENCHRUS.

By Agnes Chase.

INTRODUCTION.

The sandburs, common and troublesome to man and stock in sandy regions throughout the warmer parts of the United States and southward, form a compact genus of closely related species and are the most highly specialized group of the tribe Paniceae. While these grasses, by reason of their aggressiveness, are familiar to all in the regions they inhabit, the species have been much confused. The revision here offered is based primarily upon the collections in the United States National Herbarium. Type specimens have been examined in the herbaria of the New York Botanical Garden, the Academy of Natural Sciences, Philadelphia, and the Charleston Museum. In 1907 A. S. Hitchcock visited the more important herbaria of Europe, making notes upon the type specimens of species based on American collections,[1] and taking photographs of them. While his work was primarily on the genus *Panicum*, his study of Linnaeus's and Grisebach's types included those of *Cenchrus*. For the loan of Fournier's types I am indebted to the herbarium of the Universitetets Botaniske Have, Copenhagen, and to that of the Muséum d'Histoire Naturelle, Jardin des Plantes, Paris, and for Sprengel's type to Dr. Urban of Berlin. Of some species the type specimens have not been seen. In such cases the fact is stated.

In this revision the method of work outlined in the Revision of the North American Species of Panicum[2] has been followed.

The text figures, drawn by the author, illustrate the outer face of bur, that is, the side in view when the bur is attached to the axis, two views of the spikelet, and one of the fruit. The figures are all magnified five diameters. In each case the specimen from which the drawings were made is indicated. The burs are variable, and the spikelets are often distorted by the pressure of the involucre. The burs and spikelets selected were as representative of the respective species as possible. The spikelets are not always from the bur figured, but in every case they are from the same plant.

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[1] See Hitchcock, Types of American Grasses, Contr. U. S. Nat. Herb. **13**: 113–158. 1908; and Hitchcock and Chase, op. cit. **15**: 2–4. 1910.

[2] Hitchcock & Chase, Contr. U. S. Nat. Herb. **15**: 1–8. 1910.

TERMINOLOGY.

The morphological nature of the bur characteristic of *Cenchrus* seems not to have engaged the attention of botanists until recent years. In his description of the genus Linnaeus refers to the bur as an involucre; in the Species Plantarum "female glumes" is the term used for bur, as shown by the description of *C. tribuloides* "glumis femineis globosis muricato-spinosis hirsutis." The great majority of authors, early and late, have used the term involucre or involucel, common involucre, or involucre of spines. Ray uses the word "echinus," which is about the equivalent of our word "bur." Sloane writes of the "little burs or large roundish prickly seeds." Morison and Scheuchzer use the term "locusta" for the bur, apparently regarding it as a spikelet, since locusta is the term in common use by early authors for spikelet. Adanson describes the bur under calyx; Cavanilles calls it a common calyx. Trinius at first uses the term "capitulus" and later the same word for the bur of *C. tribuloides* and "involucel" for that of *C. myosuroides*. Hackel uses the word "Hüllen," envelope or husk. Several authors have used the terms bur or false capsule (Scribner, Wooton and Standley) as well as the term involucre. Nash describes the bur as consisting of "two spine-bearing valves forming a bur" (in several species, especially in *C. pauciflorus*, there is a deep cleft on the outer face of the bur). In none of these usages is there any indication of what the bur is supposed to be morphologically.

Doell[1] suggests that the involucre is derived from a leaf. He states [translated]:

> At the base of the spike of *C. tribuloides* and other species of this genus are often to be seen rudimentary bracts, from the axils of which spring branches provided with an involucre at base; this appears to me noteworthy. I suspect that the involucre itself has perhaps been formed from a many-cleft bract on the common axis. The nature and structure of the involucre will be discussed in another place. It is enough to say here that the involucre of *Cenchrus* has been derived from a single leaf.

The bract mentioned is that visible at the base of most panicles of grasses, usually represented by a minute ridge. The lowest bur of the spike in this genus is sometimes abortive, appearing as a narrow fascicle of bristles. Such an aborted bur must have been the branch that Doell observed in the axil of the bract.

Goebel,[2] as the result of a study of the development of the inflorescence of *Cenchrus echinatus* and *C. spinifex*, shows that Doell's conclusion was erroneous and that, instead, the bur is derived from cohesion of the members of a complex system of branches. This theory accords perfectly with observations made by the author.

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[1] In Mart. Fl. Bras. **2**[3]: 309. 1877.

[2] Jahrb. Wiss. Bot. Pringsh. **14**: 21–23. 1882.

In this revision "involucre" and "bur" are used as having no morphological significance, involucre meaning a covering or envelope only and bur a spiny fruit. The "body of the bur" is the cup-shaped or globose part formed by the coalesced part of the branchlets, from which the free ends extend. The "lobes" are the free ends of the innermost ring of branchlets which form the body. In some species they differ in appearance from the outer spines.

The inflorescence is, morphologically, a contracted panicle with short fascicled branches, these disarticulating from the main axis, all but a few of them being sterile. For convenience the inflorescence is here termed "spike," because it appears to be a spike, though morphologically it is a panicle.

HISTORY OF THE GENUS.

The sandburs were known to pre-Linnaean botanists from garden specimens only, or from a very few collections from the New World. Comparatively few references to them are found in pre-Linnaean botanical works. A common weed of the Mediterranean region, *Echinaria capitata*, with spikelets of spiny-lobed florets, crowded in a globose head, was commonly grouped with the sandburs by the early authors, and was included in *Cenchrus* by Linnaeus when he established that genus. The following phrase names have been identified as applying to species of *Cenchrus:*

Gramen Americanum spica echinata majoribus locustis. Scholz, Hort. Vratis. Cat. Bot. 258. 1587. This phrase name is cited by Plukenet (Phytographie **2**: 177, *pl. 92. f. 3.* 1696), whose figure is a fairly good illustration of *Cenchrus echinatus*, and by others. Scholz's work has not been seen.

Amongeaba. Piso, Med. Bras. 120. 1648. The colored plate is a crude illustration of *Cenchrus echinatus* or *C. viridis*. It is more like the latter.

Gramen tribuloides spicatum maximum Virginianum. Pluk. Phytog. **2**: 177. 1696. If the specimen or seed was sent from Virginia, as indicated by the name, it is doubtless *C. tribuloides*.

Gramen echinatum maximum spica rubra vel alba. Sloane, Cat. Plant. Jam. 30. 1696. Sloane's specimen so named, from Jamaica, preserved in the British Museum of Natural History,[1] is *C. echinatus*.

Gramen maritimum echinatum procumbens culmo longiori & spicis strigosioribus. In Insula parva arenosa *Gun cayos* dicta non procul ab urbe *Port-Royal* collegi. Sloane, Cat. Plant. Jam. 30. 1696; Hist. Jam. **1**: 108. *pl. 65. f. 1.* 1707. The plate represents a plant of *C. pauciflorus* very like Hitchcock's no. 9637 from Black River, Jamaica.

Gramen echinatum spicatum locustis crassioribus tribuloidibus Virginianum. E seminibus e Virginia transmissis. Moris. Pl. Hist. **3**: 195. *pl. 5.* 1699. The figure represents *C. tribuloides*.

Gramen locustis tumidioribus, echinatis. Scheuch. Agrost. Hist. 77. 1719. Described from a specimen in the Royal Garden at Montpellier. The description of the slender, horrid spines spreading on all sides identifies this as some species of *Cenchrus*.

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[1] See Hitchcock, Contr. U. S. Nat. Herb. **12**: 131. 1908.

Panicastrella Americana, major, annua, spica laxa, purpurascente. Michell, Nova Pl. Gen. 36. *pl. 31.* 1729. The phrase names of Sloane and of Plukenet given above as pertaining to *C. echinatus* are cited, but Sloane's phrase is changed by omitting "vel alba." The figure is a crude illustration of a *Cenchrus* bur. Michell does not indicate which of his two species it is meant to show.

Panicastrella Americana, minor, annua, spica angustiori, densa, albicante. Michell, op. cit. 37. "Gramen echinatum, maximum, spica alba. Sloan." is cited. Sloane's name, "spica rubra vel alba," applies to *C. echinatus.*

Linnaeus first describes the genus Cenchrus in the second edition of the Genera Plantarum,[1] placing it in his class "Polygamia monoecia," between *Aegilops* and *Valantia* (a genus of the Rubiaceae). The description is as follows:

"CENCHRUS*. Panicastrella *Mich.* 31.

CAL. *Involucra* plura, laciniata, echinata, in capitulum congesta: singulis sessilibus tres calyces includentibus.

Perianthium Gluma bivalvis, lanceolata, concava, acuminata, biflora, corolla brevior.

COR. altera mascula, altera hermaphrodita.

Propria singula bivalvis: valvulis lanceolatis, acuminatis, concavis, muticis: interiore minore.

STAM. singulis *Filamenta* tria, capillaria, longitudine corollulæ, *Antheræ* sagittatæ.

PIST. Hermaphroditis *Germen* subrotundum. *Stylus* filiformis, longitudine staminum. *Stigmata* duo, oblonga, pilosa, patentia.

PER. nullum.

SEM. subrotundum.

This description is copied exactly in the second, third, fourth, and fifth editions. In the Species Plantarum,[2] from which under botanical codes the name dates, Linnaeus includes five species: 1. *C. racemosus* (*Nazia racemosa* Kuntze), 2. *C. capitatus* (*Echinaria capitata* Desf.), 3. *C. echinatus*, 4. *C. tribuloides*, 5. *C. frutescens.* The generic description given above applies only to *C. echinatus* and *C. tribuloides.* In the first two species there is nothing that could be called an involucre *including* the flowers, the spines being borne on the glumes in the first and being the lobes of the lemmas in the second. The two florets described, one masculine, the other hermaphrodite, are found only in the third and fourth species. From the description it is evident that Linnaeus had dissected a bur of some species of *Cenchrus*, and the three "calyces" noted point to *C. echinatus* as the species he had, since in *C. tribuloides* there are rarely more than two spikelets. The fifth species, *C. frutescens* is not identifiable. The description is as follows:

"CENCHRUS capitulis lateralibus sessilibus, foliis mucronatis, caule fruticoso.

"Arundo graminea aculeata. *Alp. exot.* 105. *t.* 104.

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[1] 493. 1742.

[2] 1049. 1753.

"Gramen orientale spicatum fruticosum spinosum, spicis echinatis in capitulum congestis. *Tournef. cor.* 39.

"*Habitat in* America."

The description of a sessile lateral head does not apply to any grass known to us. In the second edition of the Species Plantarum [1] the habitat is changed to "Armenia." There is no specimen of this species in the Linnaean Herbarium.[2] The illustration given in Alpino's work [3] does not represent any species of grass. It appears more like a species of *Salicornia.* The plant is described as creeping in wet places, in the island of Crete.

Panicastrella Micheli, cited by Linnaeus as a synonym in the Genera Plantarum, is discussed above. Both Micheli's phrase names are referable to *C. echinatus.*

Of the two species of Linnaeus to which his generic description applies *C. echinatus* is taken as the type of the genus.

Subsequent to 1753 the first and second species were each made the type of a distinct genus. *Nazia* Adans.[4] was based on *C. racemosus,* and *Echinaria* Desf.[5] on *C. capitatus.* Recently Lunell [6] proposed the name *Nastus* (giving Dioscorides as author) for "*Cenchrus frutescens* Linn." "Not *Cenchrus* Hippokrates." Supposing *C. frutescens* L. to be congeneric with our American species of *Cenchrus,* Lunell transfers *C. carolinianus* Walt. to *Nastus.* The name *Nastus* Lunell is antedated by that of Jussieu, 1789, for a genus of Bamboseae.

Two generic names based on species now included in *Cenchrus* have been proposed. These are:

Raram Adans. Fam. Pl. **2**: 35, 597. 1763. No species are given. The generic synonyms are: "Amongeaba. *Pis.* 120." (discussed above); "Panicastrella. *Mich.* t. 31." (discussed above); "Gramen. *Pluk.* t. 92. f. 30," cited by Linnaeus under *Cenchrus echinatus;* "Echinaria. *Heist.*"[7], presumably the same as *Echinaria* Desf., to which Linnaeus's second species of *Cenchrus* is now referred; "Cenchrus. 3. *Lin. Spec.* 1050.," which is *C. echinatus.* Selecting a type species by reference to Linnaeus's Species Plantarum, *C. echinatus* is taken as the type of *Raram.*

Cenchropsis Nash in Small, Fl. Southeast. U. S. 109. 1327. 1903. "Type, *Cenchrus myosuroides* H. B. K.," the only species included. This is distinguished (in the key, page 51) by an involucre of numerous rigid bristles thickened at the base, from *Cenchrus* which is said to have an "involucre of two spine-bearing valves."

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[1] 1489. 1763.

[2] See Munro, Proc. Linn. Soc. **6**: 55. 1862.

[3] De Plantis Exoticis 104. 1627.

[4] Fam. Pl. **2**: 31, 581. 1763.

[5] Fl. Atlant. **2**: 385. 1799.

[6] Amer. Midl. Nat. **4**: 214. 1915.

[7] Heister (Syst. Pl. Gen. 12. 1748) lists this name among others under "Graminеae. Ordo 1. Monaclinae." There is nothing to indicate to what genus it refers.

DESCRIPTION OF THE GENUS AND SPECIES.

CENCHRUS L.

Spikelets sessile, one to several together, permanently inclosed in a bristly or spiny involucre or bur, composed of more or less coalesced sterile branchlets; burs sessile or nearly so on a slender, compressed or angled axis, its apex produced into a short point beyond the uppermost bur, the burs falling entire, the grains germinating within them; involucre (especially in our species) somewhat oblique, its body irregularly cleft, the lobes rigid, in most species resembling the spines, the cleft on the side of the bur next to the axis reaching to the tapering, abruptly narrowed or truncate base, the bristles or spines barbed, at least toward the summit; spikelets mostly glabrous or nearly so; first glume 1-nerved, usually narrow, sometimes wanting; second glume and sterile lemma 3 to 5-nerved, the lemma inclosing a well-developed palea and usually a staminate flower; fruit usually turgid, indurate, the lemma acuminate, the nerves visible toward the summit, the margins thin, flat, a prominent U-shaped ridge on the back just above the base, the radicle at germination breaking through its outer margin; stamens 3; styles 2, the stigmas plumose; grain dorsally compressed, with a punctiform hilum, free within the lemma and palea.

Annuals or perennials, mostly of sandy or arid soils. The burs at maturity are readily attached by their barbed spines to passing animals, the seed thus being widely distributed. In the Caribbean Islands sandburs have been found attached to the feet and plumage of water birds.

In America the species are found from Massachusetts to Oregon and south to Argentina and Chile. In the United States they are commonly called sandburs. Other names are burgrass, sand spur, hedgehog grass, and devil's burs. The species have some forage value, especially in the Southwestern States, where, starting growth in early spring, they produce an abundance of leafy forage which is readily grazed until the burs ripen. On the whole, however, the species are troublesome weeds in fields and waste ground.

About 25 species are known, 15 in the western hemisphere, the others in arid parts of southwestern Asia, eastern Africa, Australia, New Zealand, Tasmania, and Hawaii.

In *Cenchrus* is found the extreme specialization of sterile branchlets of the inflorescence, the simplest form of which is found in *Pancium*, subgenus *Paurochaetium* (*Panicum chapmani* Vasey and its allies)[1], in which the ultimate branchlet of the narrow panicle is produced beyond the uppermost spikelet as a minute bristle, persistent on the axis, the spikelet falling without it. In the West Indian genus *Paratheria* and the Australian *Chamaeraphis*, with a single sterile branchlet below the spikelet, is found the simplest form of the series in which the articulation is at the base of the spikelet-bearing branch, the sterile branchlets falling attached to it. In *Pennisetum* the sterile branchlets are few to many, usually very slender, not rigid, free or rarely united at the very base. In *Cenchrus* the sterile branchlets are rigid and united below. This specialization reaches its extreme development in our North American species, in all but one of which the united branchlets form a cuplike receptacle in which the spikelets are partly hidden. The immense burs of *C. palmeri* are the utmost known development of the specialization of sterile branchlets. Several species of the eastern hemisphere are more like the introduced *C. catharticus*. In *C. pilosus* the bristles are antrorsely scabrous. In *C. australis* of Australia, with plumose, less rigid involucre, the genus approaches *Pennisetum*.

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[1] Hitchcock & Chase, Contr. U. S. Nat. Herb. 15: 22. 1910.

In all our species the bur varies in size and in the length of the spines. This variation is not so important, systematically, as it would seem at first sight, since the bur is only a fascicle of branchlets and as such varies relatively much less than do the branchlets of an ordinary panicle. The spikelets in a single bur are unequally developed; usually one is larger with plumper grain than the rest. In the illustrations it is these better-developed spikelets that are shown and their measurements that are given in the descriptions.

In three specimens of *C. pauciflorus* (Pammel's no. 657 from Des Moines, Iowa, a plant collected by Jones at Grinnell, Iowa, and Hitchcock's no. 6128, from Oaxaca, Mexico,) the lowest burs are undeveloped, the well-developed spikelet being naked or having a few rudimentary bristles below it on the very short peduncle.

KEY TO THE SPECIES.

Involucral lobes united at the base only; spikes dense.
Plants perennial; involucral lobes terete, scabrous. . . . **1. C. myosuroides.**
Plants annual; inner involucral lobes sulcate down the outside, densely villous-ciliate within . . . . . **2. C. catharticus.**
Involucral lobes united above the base.
Blades involute, squarrose, numerous, conspicuously distichous, not over 2.5 cm. long, about 1 cm. apart. . . . . **3. C. distichophyllus.**
Blades not involute and squarrose, nor conspicuously distichous, much longer and farther apart.
Involucre with a ring of slender bristles at base. Plants annual.
Bristles antrorsely scabrous, much exceeding the involucral lobes. **4. C. pilosus.**
Bristles retrorsely barbed, not much exceeding the involucral lobes.
Burs, excluding the bristles, not over 4 mm. wide, numerous, crowded in a long spike; lobes of the involucre interlocking, not spinelike . . . . . **5. C. viridis.**
Burs, excluding the bristles, 5 to 7 mm. wide, not densely crowded; lobes of the involucre erect or nearly so or rarely one or two lobes loosely interlocking, the tips spinelike.
Spikelets about 5.5 mm. long; involucral lobes villous at base within . . . . . **6. C. echinatus.**
Spikelets 6.5 mm. long; involucral lobes long-ciliate except at summit. . . . . **7. C. insularis.**
Involucre with flattened spreading spines, no ring of slender bristles at base.
Body of the bur ovate, not over 3.5 mm. wide, tapering at base; plants perennial.
Burs glabrous; spines 4 to 6 mm. long. . . . **8. C. gracillimus.**
Burs pubescent; spines rarely over 4 mm. long, usually shorter.
Body of bur 3 to 3.5 mm. wide; spines 3 to 4 mm. long. **9. C. incertus.**
Body of bur less than 3 mm. wide; spines 2 to 3 mm. long. **10. C. microcephalus.**
Body of the bur globose, 5 mm. wide or more, not tapering at base; plants annual.
Burs, including spines, 7 to 8 mm. wide, finely pubescent. **11. C. pauciflorus.**
Burs, including spines, 10 to 40 mm. wide, densely woolly.
Burs several to many; spines not over 8 mm. long. **12. C. tribuloides.**
Burs 1 to 4; spines 1 cm. long or more. . . **13. C. palmeri.**

1. Cenchrus myosuroides H. B. K.

Cenchrus myosuroides H. B. K. Nov. Gen. & Sp. 1: 115. *pl. 35.* 1816. Collected by Humboldt and Bonpland on Flamingo Key, off the port of Batabanó, Cuba. The type specimen has not been examined, but the plate identifies the species.

Panicum cenchroides Ell. Bot. S. C. & Ga. 1: 111. 1816. Not *P. cenchroides* Rich. 1792. Collected by "Dr. Baldwin, who found it on Jekyl Island, Georgia." The type specimen in the Elliott Herbarium consists of the upper part of a culm with inflorescence.

Pennisetum pungens Nutt. Gen. Pl. 1: 54. 1818. Based on *Panicum cenchroides* Ell.

Pennisetum myosuroides Spreng. Syst. Veg. 1: 303. 1825. Based on *Cenchrus myosuroides* H. B. K.

Cenchrus elliottii Kunth, Rév. Gram. 1: 51. 1829. Based on *Panicum cenchroides* Ell.

Cenchrus alopecuroides Presl, Rel. Haenk. 1: 317. 1830. Not *C. alopecuroides* Thunb. 1794. The type specimen was collected by Haenke, but the habitat was unknown to Presl. It was probably from the coast of Peru. The type was examined in the herbarium of the German University at Prague by A. S. Hitchcock in 1907. No locality is given on the label.

Cenchrus setoides Buckl. Prel. Rep. Geol. Agr. Surv. Tex. App. 3. 1866. "Prairies, Northern Texas." The type specimen in the herbarium of the Academy of Natural Sciences, Philadelphia, consists of the upper parts of three culms with spikes. The name on the ticket is a slightly different form from that published. A second ticket reads "Texas, *Linscum & Buckley.*"

Cenchropsis myosuroides Nash in Small, Fl. Southeast. U. S. 109, 1327. 1903. Based on *Cenchrus myosuroides* H. B. K.

DESCRIPTION.

Plants perennial, solitary or in small clumps, usually 1 to 2 meters tall, glabrous as a whole; culms rather robust and woody, terete, commonly glaucous, erect or geniculate below (rarely decumbent with ascending flowering branches), commonly branching from the lower 2 to 5 nodes, most of the branches sterile, sometimes fascicled, forming conspicuous knobs at the node; sheaths loose, usually not clasping the internodes, firm, strongly nerved; ligule 2 to 3 mm. long, firm-membranaceous, with a densely ciliate margin; blades ascending or spreading, firm, 15 to 40 cm. long, 5 to 12 mm. wide, tapering from the rounded flat base to an attenuate, often involute tip, scabrous on the upper surface, rarely sparsely pilose at the base; inflorescence usually short-exserted, 10 to 25 cm. long, 5 to 9 mm. wide, strict, erect, dense, the common axis slender, angled, puberulent; burs 1-flowered, at first appressed, spreading in age, 5 to 7 mm. (mostly about 5 mm.) long, at maturity about as wide, the bristles retrorsely scabrous, united at the base only, the lowest row shorter, slender and spreading, the inner bristles slender, not flattened nor nerved, about equaling the spikelet, erect or nearly so; spikelet 4.5 to 5.5 mm. long, 1.5 to 1.8 mm. wide, acuminate; first glume about one-third the length of the spikelet; second glume and sterile lemma 3 to 5-nerved, the glume slightly shorter than the equal sterile lemma and fruit.

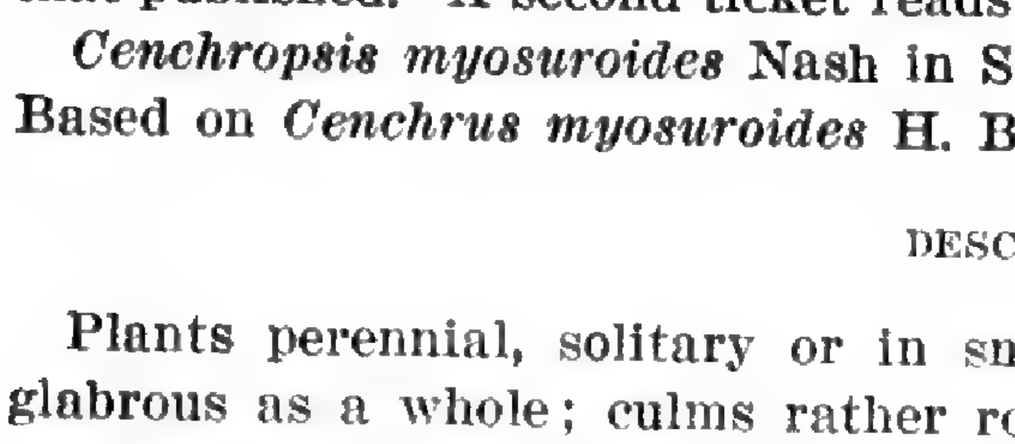

FIG. 7.—*Cenchrus myosuroides.* From *León & Voisard* 835, Cuba.

DISTRIBUTION.

Moist sandy open ground or scrubland near the coast, southern Georgia and Florida, the Florida Keys, and in southern Louisiana and Texas, south through Mexico, ascending to 2,000 meters, and in the West Indies and South America.

GEORGIA: Jekyl Island, *Baldwin*.
FLORIDA: Indian Key, *Curtiss* 3620, 5643. Joe Kemps Key, *Eaton* 1345. Key Largo, *Chase* 3936. Homosassa, *Combs* 982.
LOUISIANA: Bayou Terre Bonne, *Wurzlow* in 1913. Cotes Blanches, *Langlois* in 1886.
TEXAS: Del Rio, *Dewey* in 1891. Western Texas, *Wright* 802; *Havard* in 1881. Eagle Pass, *Havard* 81.
LOWER CALIFORNIA: Comondú, *Brandegee* in 1889.
SONORA: Hermosillo, *Hitchcock* 3611; *Rose, Standley & Russell* 12484. Guaymas, *Palmer* 327 in 1887. Yaqui River, *Palmer* 10 in 1869.
CHIHUAHUA: Chihuahua, *Pringle* 429; *Wilkinson* in 1885.
COAHUILA: Saltillo, *Hitchcock* 5647.
DURANGO: Torreón, *Hitchcock* 7560. Durango, *Hitchcock* 7614; *Palmer* 868 in 1896.
ZACATECAS: San Juan Capistrano, *Rose* 2453.
AGUASCALIENTES: Aguascalientes, *Hitchcock* 7450.
HIDALGO: Dublán, *Pringle* 9598.
QUERÉTARO: Querétaro, *Basile* 29; *Agniel* 10270.
GUANAJUATO: Irapuato, *Hitchcock* 7402.
JALISCO: Guadalajara, *Palmer* 765 in 1886.
PUEBLA: Tehuacán, *Amer. Gr. Nat. Herb.* 619.
OAXACA: Tomellín, *Hitchcock* 6199. Oaxaca, *Hitchcock* 6131.
REVILLAGIGEDO ISLANDS: San Benedicto, *Anthony* 370; *Barkelew* 171. Socorro, *Barkelew* 202; *Townsend* in 1889.
CUBA: Santiago de Cuba, *León & Voisard* 835.
PORTO RICO: Cabo Rojo, *Hess* 118. Mona Island, *Hess* 443; *Britton, Cowell & Hess* 1674.
PARAGUAY: Central Paraguay, *Morong* 214.
URUGUAY: Montevideo, *Arechavaleta*, without date.
BOLIVIA: Farija, *Fries* 1103.
PERU: Callao, *Wilkes Expl. Exped.*
ARGENTINA: Córdoba, Stuckert in Kneucker Gram. Exs. 428; *Stuckert* 45. Without locality, *Jorgensen* 1144; *Jameson*.

2. Cenchrus catharticus Delile.

Cenchrus catharticus Delile, Cat. Hort. Monsp. 1838; Schlecht. Linnaea **13**: Litt. 103. 1839. Apparently described from specimens grown in the botanical garden at Montpellier from seeds sent from Nubia, Africa, by Dr. Lush. The description, though inadequate, mentions the characteristic tomentose-ciliate inner side of the inner involucral bristles. We are unable to verify the reference to the Montpellier seed catalogue of 1838. The full title as given by Schlechtendal reads, "Index complectens semina in horto botanico regio Monspeliensi anno 1838 collecta, pro mutua commutatione oblata, additis characteribus specificis plantarum quarundam, vel ex toto novarum, vel accuratius nuper observatarum. 8vo." This would seem to indicate that the species was described in the index. Delile's name does not appear, but he was director

of the Montpellier garden, and in the author index in Linnaea Delile is given for page 102, where the article on the Index Monspeliensis begins. Through the kindness of Dr. Granel, director of the Jardin des Plantes, Montpellier, we have received two specimens of *Cenchrus catharticus* from the Delile Herbarium. These are labeled, "In hort. Monspel. cult. anno 1842," hence are not part of the type material, which may not have been preserved, but serve to identify the species without doubt.

Cenchrus niloticus Fig. & DeNot. Mem. Accad. Sci. Torino **14**: 380. *pl. 33.* 1852. Described from Nubia. The detailed description and the plate identify the species.

Cenchrus annularis Anderss. in Peters, Reise Mossamb. Bot. 553. 1864. Described from Mozambique. The description identifies the species.

DESCRIPTION.

Plants annual, glabrous as a whole, decumbent and rooting at the lower nodes, the ends and the branches ascending; culms 30 to 100 cm. long, not much compressed, scabrous below the inflorescence; sheaths loose, keeled, scabrous at the summit; ligule stiffly ciliate, about 1 mm. long; blades narrowly ascending, 10 to 20 cm. long, 5 to 6 mm. wide at the base, tapering thence to an attenuate involute tip, scabrous on the upper surface, smooth or nearly so beneath; spikes included at base or short-exserted, 8 to 10 cm. long, about 7 to 9 mm. wide, the axis slender, angled, scabrous; burs usually 2-flowered, nearly erect, 4 to 6 mm. long, scarcely as wide, the pedicel almost obsolete; bristles united at the base only, the outer row short, terete, spreading, unequal, the inner (7 to 10) flattened, subequal, rigid, erect, the scabrous tips slightly spreading, the outer surface sulcate down the middle, with 1 to 3 green nerves in the sulcus, densely villous along the margin on the inner surface except at the summit; spikelets slightly shorter than the inner involucral lobes; first glume developed or obsolete, second glume and sterile lemma thin, faintly 3 to 7-nerved, two-thirds to three-fourths as long as the fruit, the sterile palea usually well developed; fruit 4 to 4.5 mm. long, about 1.5 mm. wide, acuminate.

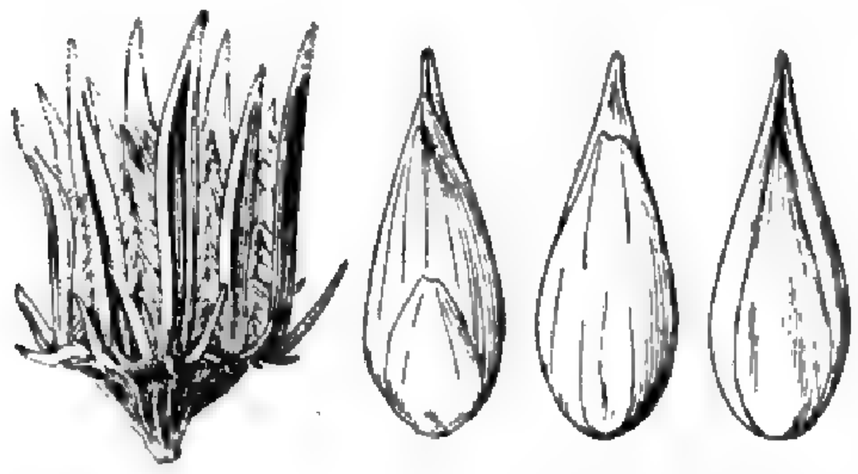

FIG. 8.—*Cenchrus catharticus*. From specimen from the Delile Herbarium.

Known in America only from ballast about Mobile, Alabama; several specimens collected in 1891 and 1892 by Dr. Charles Mohr. Our plants agree with the specimens from the Delile Herbarium and with Abyssinian specimens. In the plant described in Hooker's Flora of British India[1] under the name of *Cenchrus catharticus* the inner involucral bristles are longer, more sharply pointed, and less rigid.

3. Cenchrus distichophyllus Griseb.

Cenchrus distichophyllus Griseb. Cat. Pl. Cub. 234. 1866. "Cuba occ. (Wr[ight] 3475)." The type specimen, collected by Wright in 1863, is in the Grisebach Herbarium. It consists of a single fertile culm and a tuft of one fertile and several sterile culms.

DESCRIPTION.

Plants perennial; culms tufted, rigid, erect, or ascending from a curved, not geniculate base, simple or with a few appressed branches, the numerous inter-

[1] **7**: 90. 1896.

nodes very short, the long leafless upper part of the culm appressed-pubescent; sheaths overlapping, appressed-pubescent, often becoming glabrate in age; ligule ciliate, scarcely 1 mm. long; blades 1.5 to 2.5 cm. long, about 1.5 mm. wide, conspicuously distichous, stiffly spreading at a uniform angle and usually about 1 cm. apart, involute, sharp-pointed, glabrous on the outer surface, scabrous on the inner, sometimes with a few long hairs at the base; spike long-exserted, 2 to 3 cm. long, bearing usually 5 to 7 spreading yellow burs, the slender axis glabrous, its summit prolonged beyond the uppermost bur as a sharp point 2 to 4 mm. long; burs, including the spines, 5 to 6 mm. long, nearly as broad, the body of the bur about 3 mm. long and 2 mm. wide, puberulent, the outer spines subterete, swollen at the base, the lobes of the involucre about 10, prolonged into sharp, slender spines, pilose on the inner surface toward the base, retrorsely barbed toward the tip; spikelet solitary, terete or thicker than wide, about 3.3 mm. long and 1.3 mm. wide; first glume very narrow, often obsolete; second glume obtuse, shorter than the subequal pointed sterile and fertile lemmas; fruit turgid, the palea puberulent on the upper half.

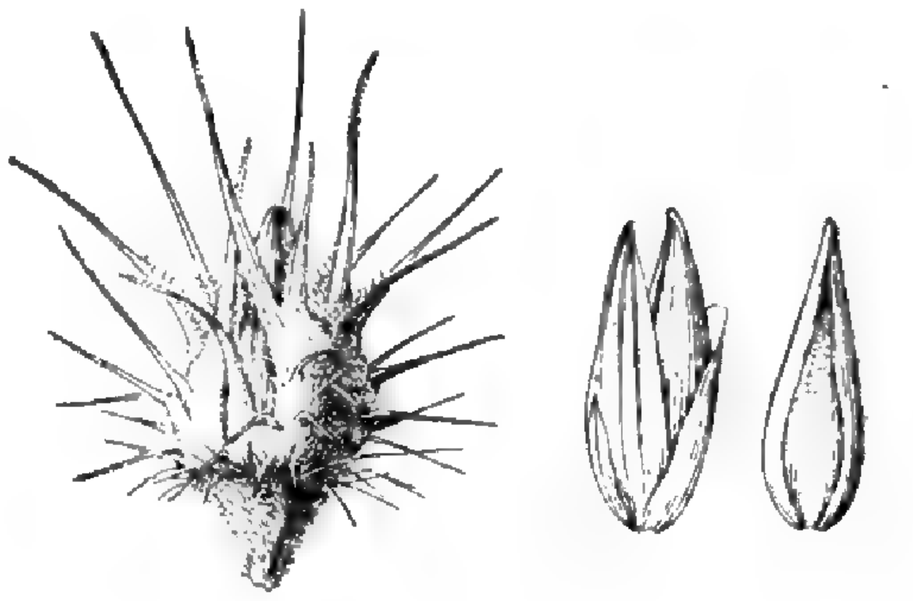

FIG. 9.—*Cenchrus distichophyllus.* From the type specimen.

DISTRIBUTION.

Dry sandy pine barrens, Province of Pinar del Río, Cuba.

CUBA: Laguna Jovero, *Shafer* 10717. San Julián, *León* 6941; *Lamas* 7475. "Western Cuba," *Wright* 3475.

In Robinson's Flora of the Galápagos Islands[1] some sterile specimens collected on Albemarle Island are doubtfully referred to *Cenchrus distichophyllus.* Stewart[2] also refers two of his collections to this species, one of which, his no. 1235, sent to the National Herbarium, is a sterile specimen of *Sporobolus virginicus* (L.) Kunth. The other specimens are doubtless the same species.

4. Cenchrus pilosus H. B. K.

Cenchrus pilosus H. B. K. Nov. Gen. & Sp. 1: 116. *pl. 36.* 1816. "Crescit in planitie herbida Provinciae Novobarcellonensis (Llanos de Nueva Barcellona), juxta Villa del Pao," Venezuela. The type specimen has not been examined, but the description and the plate identify it as a small, exceptionally pilose specimen of the species later described as *C. pallidus.*

Cenchrus pallidus Fourn. Mex. Pl. 2: 50. 1886. "In locis ruderalis, *Hacienda de Santa Cruz* pr. *Tehuantepec* in prov. *Oajacensi*, . . . (LIEBM. n. 465)." The type specimen, *Liebmann* 465, in the Copenhagen Herbarium, bears the name in Fournier's hand.

DESCRIPTION.

Plants annual; culms often rather stout, compressed, usually decumbent at base and rooting at the lower nodes, 20 to 100 cm. long, simple or sparingly branching below, scabrous below the inflorescence, otherwise glabrous; sheaths

[1] Proc. Amer. Acad. 38: 118. 1902.

[2] Botanical Survey of the Galapagos Islands, Proc. Cal. Acad. Sci. IV. 1: 31. 1911

keeled, loose, glabrous or toward the summit scabrous, or rarely ciliate; ligule ciliate, about 0.8 mm. long; blades 10 to 40 cm. long, or rarely longer, 6 to 12 mm. wide, rather thin and lax, flat or folded at the rounded base, scabrous on the upper surface and usually pilose, glabrous on the lower surface or scabrous toward the summit; spikes finally rather long-exserted, 5 to 14 cm. long, dense or loose at the base, the axis strongly angled, scabrous, a tuft of white hairs usually borne just below the burs, the summit prolonged beyond the uppermost bur into a slender point 2 to 3 mm. long; burs globose, the body about 5 mm. high, as broad or broader, densely villous, tawny, the numerous slender bristles antrorsely scabrous, commonly purplish, the inner more than twice as long as the body, the lobes of the body about 8, interlocking at maturity; spikelets usually 3, exceeding the body of the involucre, 4 to 4.5 mm.

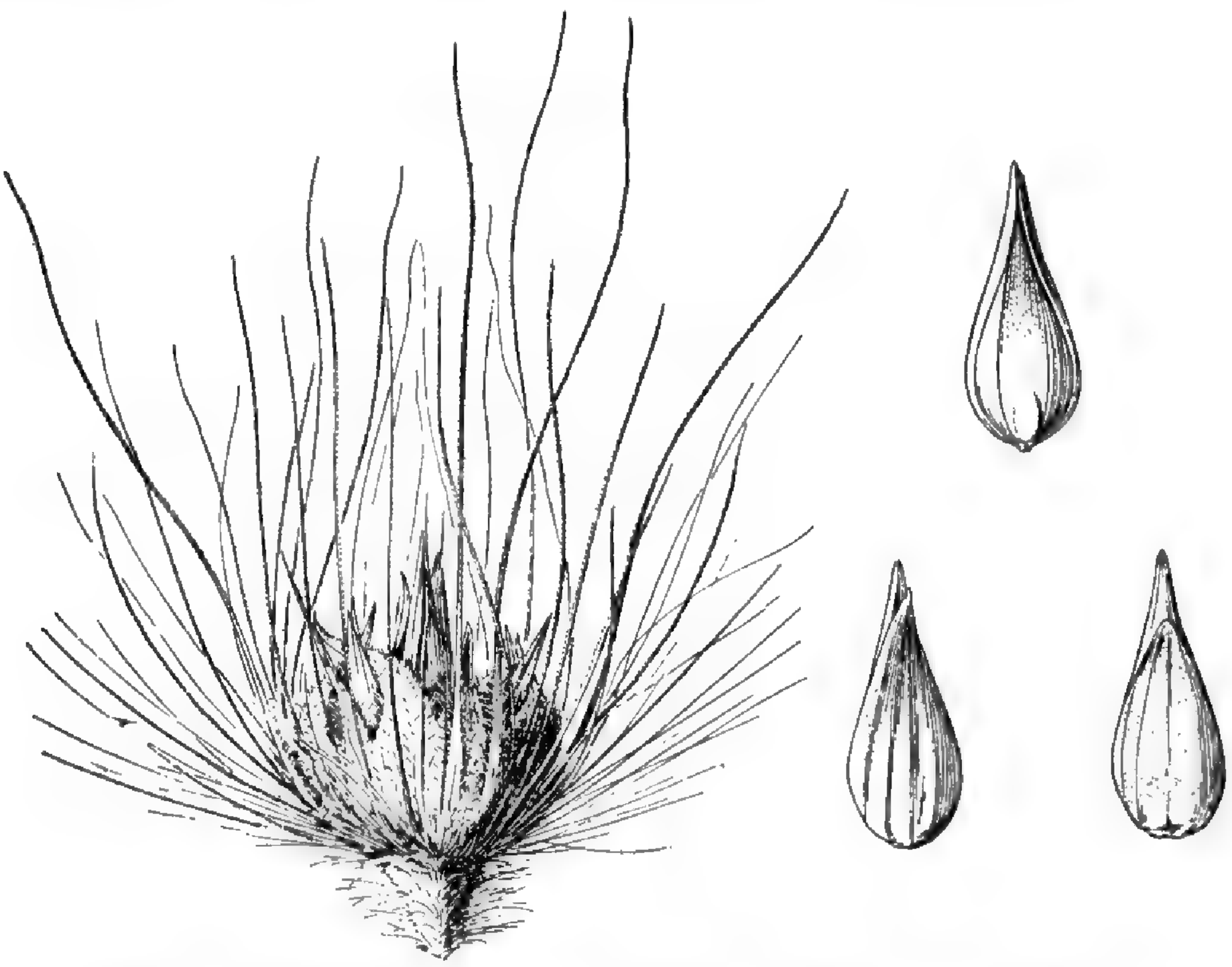

FIG. 10.—*Cenchrus pilosus*. From the type specimen of *C. pallidus*.

long, about 1.8 mm. wide, acuminate; first glume obsolete; second glume and sterile lemma shorter than the fruit, thin, very minutely puberulent; fruit turgid, the palea minutely puberulent between the nerves except toward the base.

DISTRIBUTION.

Moist open ground up to about 1,000 meters altitude, southern Mexico to northern South America.

MORELOS: Yautepec, *Pringle* 11219.
COLIMA: Jala, *Hitchcock* 7050.
GUERRERO: Balsas, *Amer. Gr. Nat. Herb.* 620. Iguala, *Pringle* 8394.
OAXACA: Tomellín, *Hitchcock* 6217. Tehuantepec, *Liebmann* 465.
YUCATÁN: Izamal, *Millspaugh* 70. Mérida, *Collins* 22.
SALVADOR: Acajutla, *Hitchcock* 8997. Sonsonate, *Hitchcock* 8978.
NICARAGUA: San Juan del Sur, *Hitchcock* 8596. Masaya, *Hitchcock* 8628, 8739. Jinotepe, *Hitchcock* 8667. Corinto, *Hitchcock* 8619.
COLOMBIA: Santa Marta, *Smith* 153.
VENEZUELA: El Valle, *Miller & Johnston* 179.
CURAÇAO: Willemstad, *Britton & Shafer* 3156.

5. Cenchrus viridis Spreng.

Cenchrus viridis Spreng. Syst. Veg. 1: 301. 1825. "Guadalupa." In the Krug and Urban Herbarium in the Berlin Botanical Museum is a specimen "ex herb. Sprengel," ticketed "*Cenchrus viridis* Spreng. Guadeloupe. Bertero legit." A second label bears the date "1817–19." This specimen, which is doubtless the type, consists of two flowering culms without the bases.

Cenchrus dactylolepis Steud. Syn. Pl. Glum. 1: 109. 1854. "*C. echinatus* Hochst. Hrbr. nr. 12. a. Surinam." Two burs from this specimen were kindly sent by the director of the herbarium of the Paris Museum.

Cenchrus echinatus var. *viridis* Spreng.; Griseb. Fl. Brit. W. Ind. 556. 1864. Presumably based on *C. viridis* Spreng.

?*Cenchrus viridis* var. *macrocephalus* Doell in Mart. Fl. Bras. 2³: 310. 1877. "Humboldt extra Brasiliam legit." The type has not been examined. It would appear to be a specimen with bristles longer than usual, such a specimen as Hitchcock's no. 9910 from Cartagena, Colombia.

?*Cenchrus rigidus* Willd.; Doell in Mart. Fl. Bras. 2³: 310. 1877. A herbarium name given as synonym of *C. viridis* var. *macrocephalus*.

DESCRIPTION.

Plants annual; culms often rather robust, 30 to 100 cm. tall or more, usually terete, erect from a more or less geniculate base, the lower internodes commonly short, sparingly branching from the base or lower nodes, glabrous, or scabrous below the spike only; sheaths mostly overlapping, loose, keeled, glabrous; ligule ciliate, scarcely 1 mm. long; blades thin, flat, lax, mostly 10 to 30 cm. long, 6 to 12 mm. wide, rounded at the base, scabrous on the upper surface, on the margins, and on the midnerve beneath; spike usually short-exserted, 4 to 10 cm. long, rarely longer, dense, the slender axis minutely pubescent, the naked tip 2 to 4 mm. long; burs depressed-globose, the body about 4 mm. high, as broad or broader, villous, tawny, the outer bristles numerous, very slender, crowded toward the base, the inner usually exceeding the body and the spikelets, erect or spreading, the lobes of the body usually 6 to 8, interlocking at maturity; spikelets usually 3, exceeding the body of the involucre, mostly 4 to 4.5 mm. long, about 1.4 mm. wide; first glume obsolete; second glume two-thirds to three-fourths as long as the subequal sterile lemma and fruit.

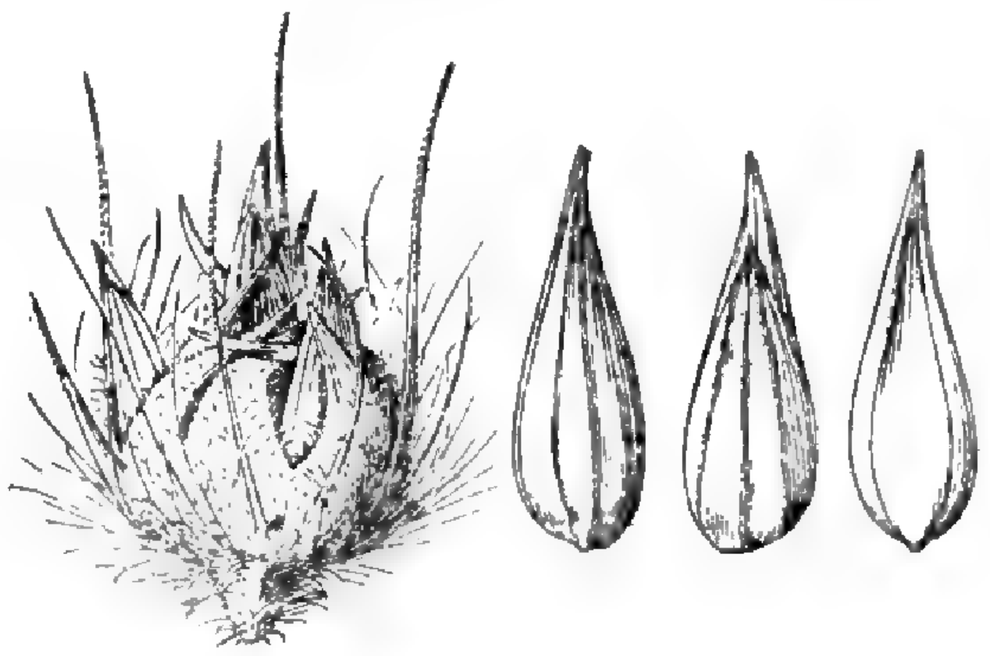

FIG. 11.—*Cenchrus viridis*. From the type specimen.

DISTRIBUTION.

Open ground, often a weed in cultivated fields and waste places, Florida Keys, Mexico, and the West Indies to Brazil; also in the Philippine Islands, Guam, Siam, and northern Australia, doubtless introduced from America.

FLORIDA: Key Largo, *Chase* 3931; *Hitchcock* in 1903. Upper Matecumbe Key, *Pollard, Collins & Morris* 145. Key West, *Rugel* 120.
TAMAULIPAS: Tampico, *Palmer* 155 in 1910.
VERACRUZ: Sanborn, *Orcutt* 3074.

PUEBLA: Without locality, *Nicolas* 26.
COLIMA: Jala, *Hitchcock* 7008. Manzanillo, *Hitchcock* 7043; *Palmer* 1086 in 1890. Paso del Río, *Emrick* 6.
YUCATÁN: Progreso, *Millspaugh* 1682. Mérida, *Schott* 498. Izamal, *Gaumer* 1084.
QUINTANA ROO: Chichankanab, *Gaumer* 2448.
GUATEMALA: Cerro Gordo, *Heyde & Lux* 4296. Escuintla, *Hitchcock* 9003. Los Amates, *Kellerman* 5163. Alta Verapaz, *Pittier* 254.
HONDURAS: San Pedro Sula, *Thieme* 5580.
SALVADOR: La Unión, *Hitchcock* 8773.
NICARAGUA: Corinto, *Hitchcock* 8610. Masaya, *Hitchcock* 8638. Jinotepe, *Hitchcock* 8668.
COSTA RICA: Los Conventillos, *Tonduz* 2857. Zent Farm, *Pittier* 16739; *Tonduz* 194. Talamanca, *Tonduz* 8741. Port Limón, *Hitchcock* 8436. Puntarenas, *Hitchcock* 8567.
PANAMA: Matías Hernández, *Pittier* 6790. Taboga Island, *Hitchcock* 8064; *Killip* 4149. Toro Point, *Hitchcock* 8043. Culebra, *Amer. Gr. Nat. Herb.* 622; *Pittier* 2080. Empire, *Pittier* 3716. Ancón, *Killip* 4007.
BAHAMAS: Andros, *Small & Carter* 8711.
CUBA: Sierra Mendoza, *Shafer* 11152. Habana-Vedado, *León* 5618. Sancti Spiritus, *León* 837; *Clemente* 3442. Camaguey, *León* 3963. Cayo Ballenato Grande, *Shafer* 1022. Sierra Nipe, *Shafer* 3172. Santiago, *Pollard, Palmer & Palmer* 284. El Cuero, *Britton & Cowell* 12798. Manatí, *León* 5683, 6007. Isle of Pines, *Britton, Wilson & León* 15296. Without locality, *Wright* 3889.
SANTO DOMINGO: Santo Domingo, *Millspaugh* 808. Azua, *Rose, Fitch & Russell* 3948. Without locality, *Wright, Parry & Brummel* 621.
JAMAICA: Hope Gardens, *Harris* 11237; *Hitchcock* 9314; *Maxon* 1640. Gordon Town (?), *Hart* 783. Spanish Town, *Harris* 12479; *Hitchcock* 9300. New Forest, *Hitchcock* 9841. Ewarton to Moneague, *Hitchcock* 9440. Ipswich, *Hitchcock* 9588. Grand Cayman, *Millspaugh* 1268.
PORTO RICO: Guanica Bay, *Chase* 6517. Juana Diaz, *Sintenis* 2904. Cayo Muertos, *Britton, Cowell & Brown* 4986. Vieques, *Shafer* 2653; *Chase* 6667. Culebra, *Britton & Wheeler* 122; *Millspaugh* 619.
LEEWARD ISLANDS: Guadeloupe, *Duss* 2718.
WINDWARD ISLANDS: Martinique, *Duss* 790.
TRINIDAD: Port of Spain, *Hitchcock* 9995. San Juan, *Broadway* 2609. Cedros, *Broadway* 4916.
COLOMBIA: Cartagena, *Hitchcock* 9910. Santa Marta, *Smith* 160. Puerto Colombia, *Hitchcock* 9929. Palmira, *Pittier* 827.
VENEZUELA: Margarita, *Miller & Johnston* 186. Bobures, *Jahn* 351.
BRAZIL: Organ Mountains, *Gardner* 856. Amazonas, *Kuhlmann* 2949.
BOLIVIA: Guanai, *Rusby* 190.

6. Cenchrus echinatus L.

Cenchrus echinatus L. Sp. Pl. 1050. 1753. "Habitat in Jamaica, Curassao." The type specimen in the Linnaean Herbarium was examined by A. S. Hitchcock in 1907. It is marked "echinatus" in Linnaeus's hand, but without indication as to its origin. One of the phrase names cited by Linnaeus is "Gramen echinatum maximum, spica rubra s. alba. Sloan. jam. 30. hist. 1. p. 108." The specimen so named in the Sloane Herbarium was also examined by Professor Hitchcock.

Cenchrus pungens H. B. K. Nov. Gen. & Sp. 1: 115. 1816. "Crescit . . . regni Peruviani prope Guayaquil." The type has not been examined. It is

said by the authors to be very closely related to *C. echinatus*. The description indicates a depauperate specimen of that species with short spikes, and with but two spikelets in a bur. Doell, who examined an authentic specimen, states [1] that it is a form of *C. echinatus* in which the spikelets are slightly longer than the involucre.

Cenchrus macrocarpus Ledeb.; Steud. Nom. Bot. ed. 2. 1: 317. 1840. A garden name given as a synonym of *C. echinatus* L.

Cenchrus brevisetus Fourn. Mex. Pl. 2: 50. 1886. "*Valle de Orizaba* (SCHAFFN[ER] n. 198 in herb. FRANQ., BOURG[EAU] n. 3140 . . . BOTT[ERI] n. 133.)." Bourgeau's no. 3140 in the National Herbarium, bearing the name in Fournier's hand, and in the herbarium of the Botanical Garden of Petrograd is about the average form of *C. echinatus*. In his key to the species of *Cenchrus*, Fournier places *C. echinatus* with *C. myosuroides* and *C. multiflorus* Presl (a species of *Pennisetum*), as having the inner involucre cleft nearly to the base. Among the specimens cited under *C. echinatus* are Liebmann's nos. 468, 471, and 472. The specimens in the Copenhagen Herbarium are those studied by Fournier.[2] All three are ordinary *C. echinatus*. In this species and its allies the involucre is irregularly cleft; sometimes one of the clefts (besides that on the side toward the axis) reaches well toward the base. This is not constant in burs on the same spike. It seems probable that in his study of the specimens Fournier referred to *C. echinatus* those specimens in which he observed burs with a single deep cleft, while those in which a deep cleft was not noted he referred to *C. brevisetus*. The short bristles, which gave the specific name, are short in comparison to those of *C. pallidus* (*C. pilosus*), which in Fournier's arrangement is grouped with *C. brevisetus*.

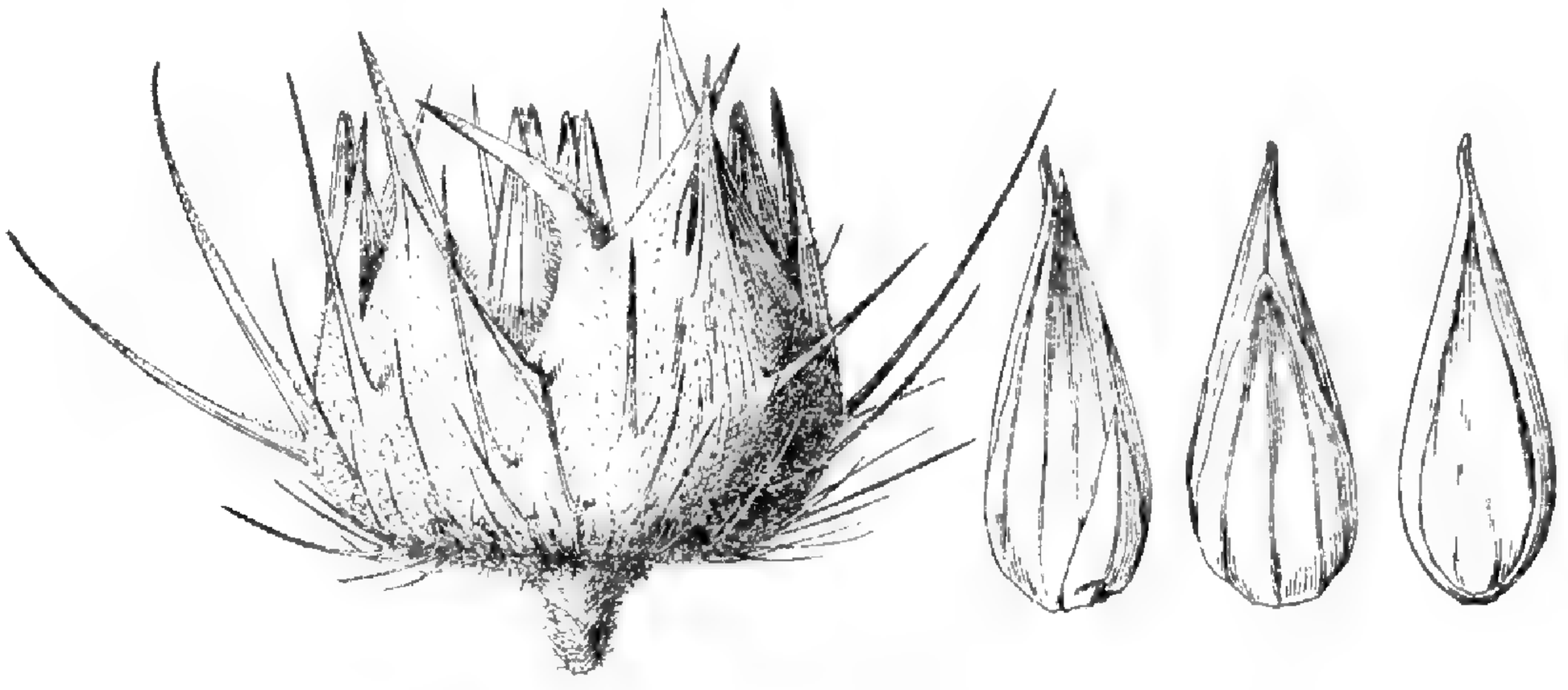

FIG. 12.—*Cenchrus echinatus*. From *Hitchcock* 9379, Jamaica.

Cenchrus echinatus brevisetus Scribn. in Millsp. Field Mus. Bot. 2: 26. 1900. Based on *Cenchrus brevisetus* Fourn.

DESCRIPTION.

Plants annual; culms ascending from a geniculate or decumbent base, often rooting at the lower nodes, branching from the base and usually from the lower nodes, commonly 25 to 60 cm. long, sometimes as much as 1 meter long, compressed, scabrous below the spike, otherwise glabrous; sheaths loose, mostly

[1] In Mart. Fl. Bras. 2[3]: 310. 1877.

[2] See p. 45.

compressed, glabrous or hairy on the margin toward the summit, rarely sparsely pilose; ligule ciliate, about 1 mm. long; blades commonly 6 to 20 cm. long and 3 to 8 mm. wide (extremes larger or smaller), usually rather stiff, but sometimes lax, flat, tapering from the rounded base to a more or less involute or folded summit, glabrous beneath, scabrous and sparsely pilose on the upper surface, at least toward the base; spikes finally rather long-exserted, 3 to 10 cm. long (commonly not over 7 cm. long), not very dense, the axis strongly flexuous, scabrous; burs truncate at base, the body 4 to 7 mm. high, as broad or broader, pubescent, tawny or plumbeous, the outer slender bristles on the average less numerous and relatively shorter than in *C. viridis*, the inner stout, broadened at base, the longest of them usually about equaling the lobes of the body but sometimes longer or sometimes much reduced, ascending or spreading, the lobes of the body commonly 10, erect or bent inward or sometimes one or two lobes inflexed, often with one or two green lines down the back, the tips hard and spinelike, retrorsely barbed; spikelets 3 to 6, usually 4, about equaling the lobes or shorter, 4.5 to 6 mm. long, about one-third as wide; first glume narrow, 1-nerved; second glume two-thirds to three-fourths as long as the subequal sterile lemma and fruit, the summit of the fertile lemma submembranaceous, the 3 nerves usually obvious.

Throughout the range of this species the burs vary greatly in size; as Sloane,[1] writing of the grass in Jamaica, expresses it: "Of this there are of various bignesses." Mexican plants are on the average more robust than those of the United States and the West Indies, with blades often 10 to 12 mm. wide, and burs 6 to 7 mm. wide (excluding the bristles), but occasional United States and West Indian specimens are about as robust as any of the Mexican plants.

In a few West Indian specimens the burs are depauperate, only 2 or 3 mm. wide and with but one or two spikelets. In most of these specimens, however, normal or nearly normal burs are found on the same plant.

DISTRIBUTION.

Open ground and waste places, from South Carolina to New Mexico and south to Uruguay; a common weed throughout the warmer part of its range; sparingly introduced in Hawaii, the Philippines, and Samoa.

SOUTH CAROLINA: Aiken, *Ravenel* in 1869.

GEORGIA: Darien, *Smith* 2151.

FLORIDA: Jacksonville, *Combs* 42; *Curtiss* 3619, 4042, 5152. Duval County, *Fredholm* 5236. Madison County, *Combs* 218; *Hitchcock* 2281. Monticello, *Combs* 339. Wewahitchka, *Biltmore Herb.* 1883a. Lake City, *Hitchcock* 2278; *Combs & Rolfs* 150; *Quaintance* 853; *Ricker* 877. Gainesville, *Chase* 4226. Archer, *Quaintance* 816. Eustis, *Hitchcock* 2279; *Nash* 189, 1134, 2100. Grasmere, *Combs & Baker* 1046. Ouasi, *Baker* 7. Jensen, *Hitchcock* 739. Miami, *Amer. Gr. Nat. Herb.* 615; *Eaton* 93; *Hitchcock* 663. Key Largo, *Pollard, Collins & Morris* 167. Lakeland, *Hitchcock* 830. Marco, *Standley* 12736. Fort Myers, *Standley* 12834; *J. P. Standley* 357; *Hitchcock* 448. Manavista, *Tracy* 7046. Newport, *Pollard, Collins & Morris* 167. Key West, *Hitchcock* in 1906. Fellsmere, *Tracy* 9387. Sneeds Island, *Tracy* 6512.

TEXAS: Del Rio, *Hitchcock* 13633. Without locality, *Nealley* in 1890 and 1893.

NEW MEXICO: Without locality, *Fendler* 983.

LOWER CALIFORNIA: Comondú, *Brandegee* 4. Santa Agueda, *Palmer* 220 in 1890. San José del Cabo, *Purpus* 320.

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[1] Voy. Jam. 1: 108. 1707.

SONORA: Yaqui River, *Palmer* 12 in 1869. Alamos, *Rose, Standley & Russell* 13019, 13029. Hermosillo, *Rose, Standley & Russell* 12495; *Hitchcock* 3602; *Chase* 5500. Guaymas, *Palmer* 190 in 1887.
CHIHUAHUA: Southwestern Chihuahua, *Palmer* 22 in 1885.
COAHUILA: Monclova, *Palmer* 1343 in 1880.
NUEVO LEÓN: Monterrey, *Hitchcock* 5556.
TAMAULIPAS: Victoria, *Palmer* 83 in 1907. Tampico, *Hitchcock* 5786.
SAN LUIS POTOSÍ: Cárdenas, *Amer. Gr. Nat. Herb.* 616.
DURANGO: Durango, *Hitchcock* 7607; *Palmer* 880 in 1896. Torreón, *Hitchcock* 7558.
SINALOA: Mazatlán, *Rose, Standley & Russell* 13674. Fuerte, *Rose, Standley & Russell* 13561. Rosario, *Rose* 3110. Topolobampo, *Rose, Standley & Russell* 13280.
AGUASCALIENTES: Aguascalientes, *Hitchcock* 7439, 7490.
JALISCO: Guadalajara, *Hitchcock* 7293; *Safford* 1390. San Nicolás, *Hitchcock* 7219. Zapotlán, *Hitchcock* 7124. Chapala, *Rose & Painter* 7623. Colotlán, *Rose* 3603. La Junta, *Hitchcock* 7001.
GUANAJUATO: Irapuato, *Hitchcock* 7405.
QUERÉTARO: Querétaro, *Hitchcock* 5841½, 5861; *Agniel* 10261.
MORELOS: Cuernavaca, *Hitchcock* 6852, 6876.
PUEBLA: Techuacán, *Hitchcock* 6076.
VERACRUZ: Orizaba, *Hitchcock* 6339; *Bourgeau* 3140; *Seaton* 51. Mirador, *Ross* 644; *Liebmann* 468. Coatzacoalcos, *Ross* 1050. Jalapa, *Hitchcock* 6629. Veracruz, *Hitchcock* 6556, 6571, 6579.
COLIMA: Alzada, *Hitchcock* 7100. Manzanillo, *Hitchcock* 7043½.
MICHOACÁN: Uruápan, *Hitchcock* 6988.
GUERRERO: Santa Fé, *Hitchcock* 6690. Balsas, *Hitchcock* 6787.
OAXACA: Tomellín, *Hitchcock* 6198, 6247. Oaxaca, *Hitchcock* 6127; *Pringle* 5566. Santa Gertrudis, *Liebmann* 471. Cuicatlán, *Nelson* 1653.
YUCATÁN: Progreso, *Millspaugh* 1698.
GUATEMALA: Mazatenango, *Kellerman* 5110. Lake Amatitlán, *Kellerman* 4780. Guatemala City, *Hitchcock* 9083; *Holway* 591. Secanquím, *Pittier* 254.
HONDURAS: Puerto Sierra, *Wilson* 245.
SALVADOR: San Salvador, *Velasco* 18. Without locality, *Renson* 169.
NICARAGUA: San Juan del Sur, *Hitchcock* 8598. Masaya, *Hitchcock* 8637.
COSTA RICA: Orotina, *Holway* 342. Boca Banana, *Tonduz* 9120. Puerto Limón, *Pittier* 4202. Atenas, *Hitchcock* 8519. Alajuela, *Jiménez* 132.
PANAMA: Cristóbal, *Hitchcock* 7949. Balboa, *Hitchcock* 7994, 8001. Empire, *Pittier* 3715. Ancón, *Célestine* 27.
BERMUDA: *Brown & Britton* 126; *Collins* 142.
BAHAMAS: Fortune Island, *Eggers* 3980.
CUBA: Guanajay, *Palmer & Riley* 665, 679, 781. Guane, *Shafer* 10374. Between Río Cayaguateje and Sierra Guane, *Shafer* 10445. Sierra de Anafe, *Wilson & León* 11489. Habana, *León* 188, 2604, 4753. Rincón, *Wilson* 1043. Santiago de las Vegas, *Baker & Wilson* 515; *Hitchcock* in 1906. Sancti Spiritus, *Shafer* 12074. La Gloria, *Shafer* 320. Santiago de Cuba, *León & Voisard* 838; *Millspaugh* 1110. Guantánamo Bay, *Britton* 2124. Isle of Pines, *Taylor* 24; *Britton, Britton & Wilson* 15045.
JAMAICA: Gordon Town, *Hitchcock* 9379; *Hart* 576. Hope Gardens, *Hitchcock* 9251, 9311; *Harris* 11239; *Maxon* 1644. Annatto Bay, *Maxon* 726. Port Antonio, *Fredholm* 3061. Ramble, *Hitchcock* 9514. Mount Hybla, *Harris* 11311. Ipswich, *Hitchcock* 9611. Ewarton to Linstead, *Hitchcock* 9434. New Forest, *Hitchcock* 9828. Lititz, *Harris* 12696.

SANTO DOMINGO: Barahona, *Fuertes* 1263. Constanza, *Türckheim* 3228.
PORTO RICO: Santurce, *Heller* 1346. Catano, *Millspaugh* 163. Bayamon, *Chase* 6386. Rio Piedras, *Stevenson* 3498. Arecibo, *Chase* 6563. Cumuy, *Chase* 6566. Mayaguez, *Chase* 6281. Maricao, *Chase* 6242. Guanica, *Britton, Cowell & Brown* 4911; *Chase* 6522. Penuelas, *Britton, Britton & Marble* 1758; *Chase* 6491. Aguirre, *Underwood & Griggs* 406. Guayama, *Goll* 511. Cayo Muertos, *Britton, Cowell & Brown* 4981. Fajardo, *Chase* 6654. Vieques, *Chase* 6668; *Shafer* 2470. Culebra, *Britton & Wheeler* 207. Mona Island, *Hess* 441.
VIRGIN ISLANDS: St. Thomas, *Britton, Britton & Shafer* 127; *Millspaugh* 438. St. Croix, *Ricksecker* 124, 443. St. Jan, *Eggers* 3299. Tortola, *Britton & Shafer* 913; *Fishlock* 110.
LEEWARD ISLANDS: Antigua, *Rose, Fitch & Russell* 3412; *Wullschlaegel* 633. Guadeloupe, *Duss* 3173. Dominica, *Jones* 13.
WINDWARD ISLANDS: Montserrat, *Shafer* 217. Martinique, *Duss* 791. St. Lucia, *Moore* 17. Grenada, *Broadway* 7015.
TRINIDAD: Port of Spain, *Hitchcock* 9996. Cedros, *Hitchcock* 10155. Chacachacare, *Hitchcock* 10056, 10057.
TOBAGO: Scarboro, *Broadway* 4726; *Hitchcock* 10209.
CURAÇAO: Willemstad, *Britton & Shafer* 2916.
COLOMBIA: Barranquilla, *Pittier* 1558.
VENEZUELA: Dos Caminos, *Pittier* 6307. Without locality, *Fendler* 1736.
BRITISH GUIANA: Upper Demerara River, *Jenman* 4011.
BRAZIL: Campinos, *Campos Novaes* 1257. Minas Geraes, *Widgren* in 1845. São Paulo, *Löfgren & Edwald* 2646; *Gerdes* in 1890. Lagoa Santa, *Warming* in 1863. Paraná, *Dusén* 6652. Without locality, *Glaziou* 497, 1233, 6954; *Gardner* 1190.
PARAGUAY: Central Paraguay, *Morong* 96.
URUGUAY: El Salto, *Arechavaleta* in 1893.
ARGENTINA: Misiones, *Ekman* 670.

7. Cenchrus insularis Scribn.

Cenchrus insularis Scribn. in Millsp. Field Mus. Bot. **2**: 26. 1900. "Pajaros Island, Alacran Shoals (1759). Type in Field Col. Mus. Herb. no. 61759." Part of this specimen, collected by C. F. Millspaugh, is in the National Herbarium.

DESCRIPTION.

Plants annual, resembling a robust specimen of *C. echinatus*, the rather firm blades scabrous on the upper surface, not pilose; spikes 5 to 10 cm. long, not very dense, the axis as in *C. echinatus;* burs globose, the body 9 to 11 cm. high, minutely pubescent, the obconical base villous; bristles very numerous, ascending, the outermost very slender, short, the inner successively broader at base and longer, two rather well-defined series equaling or exceeding the lobes of the body, conspicuously long-ciliate at the broad base; lobes of the body 8 to 10, suberect, exceeding the spikelets, conspicuously long-ciliate except at the sharp spinelike summits; spikelets 2 or 3, 6 to 7 mm. long, 2 to 2.2 mm. wide; first glume narrow, usually obsolete; second glume very minutely puberulent down the center or glabrous, two-thirds to three-fourths as long as the equal sterile lemma and fruit, the base of the sterile lemma and upper part of the palea minutely puberulent, the summit of the fertile lemma submembranaceous, strongly nerved.

This apparently rare species differs from *C. echinatus* in the larger burs, more numerous and longer bristles, the more uniformly cleft body with more slender-pointed lobes, and the conspicuously ciliate bases of the inner broad-based bristles and involucre lobes, these minutely pubescent on the back. Some specimens of *C. echinatus*, with burs having exceptionally long and numerous bristles, resemble *C. insularis*.

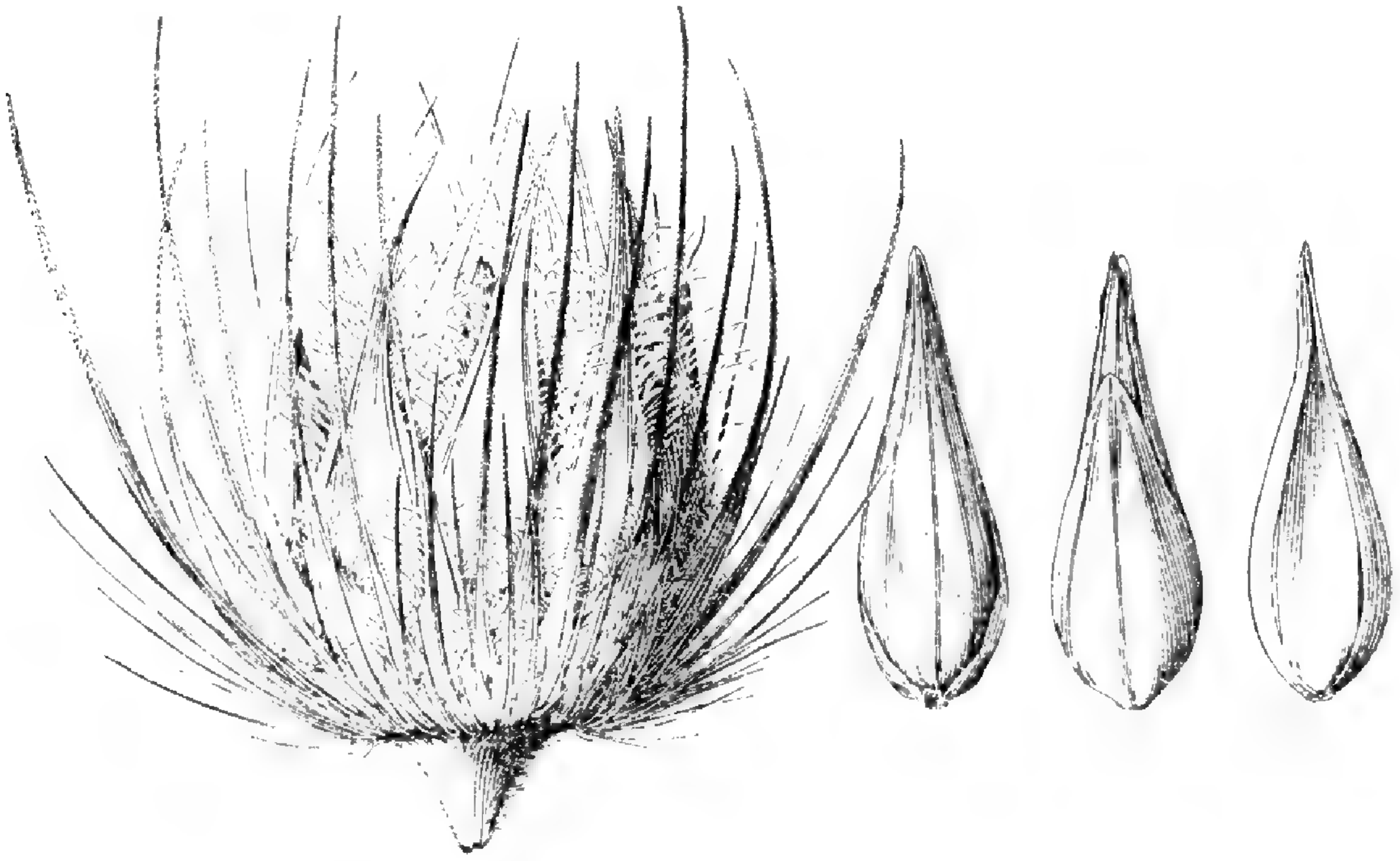

FIG. 13.—*Cenchrus insularis*. From the type specimen.

DISTRIBUTION.

Sandy beaches, Alacrán Shoals, off the northern coast of Yucatán, northern Colombia, and in Brazil.

YUCATÁN: Pájaros Island, Alacrán Shoals, *Millspaugh* 1759.
COLOMBIA: Santa Marta, *Smith* 159. Puerto Colombia, *Hitchcock* 9938.
BRAZIL: Lagoa Santa, *Warming* in 1863.

8. Cenchrus gracillimus Nash.

Cenchrus gracillimus Nash, Bull. Torrey Club **22**: 299. 1895. "Florida, occurring in the high pine land. . . . My nos. 188 and 288, collection of 1894." Nash's nos. 188 and 288 of 1894 were "collected in the vicinity of Eustis, Lake County." His no. 188 in the herbarium of the New York Botanical Garden is taken as the type.

DESCRIPTION.

Plants perennial, at length forming dense clumps, glabrous as a whole; culms 20 to 80 cm. tall, commonly branching from the lower nodes, but sometimes remaining simple, often scabrous toward the summit, compressed, slender, wiry, erect or ascending, the outer culms of large clumps geniculate at base; sheaths loose, keeled, the lower overlapping, sometimes sparsely pilose; ligule ciliate, about 0.5 mm. long; blades usually folded and stiffly flexuous, 5 to 20 cm. long, 2 to 5 mm. (usually 2 to 3 mm.) wide, scabrous on the upper surface and sometimes pilose at the base; spikes usually long-exserted, 2 to 6 cm. long, the burs not crowded, sometimes distant more than their own length, the

slender axis flexuous, scabrous; burs 3.5 to 5 mm. wide (excluding the spines), somewhat tapering to the base, glabrous; spines spreading or reflexed, all glabrous and flat, broadened at base, the lowest ones slender, shorter, some of the upper ones commonly 5 to 6 mm. long; body of the bur usually with 1 or 2 deep clefts, the lobes about 8, erect or spreading, 6 to 8 mm. long, ciliate at the

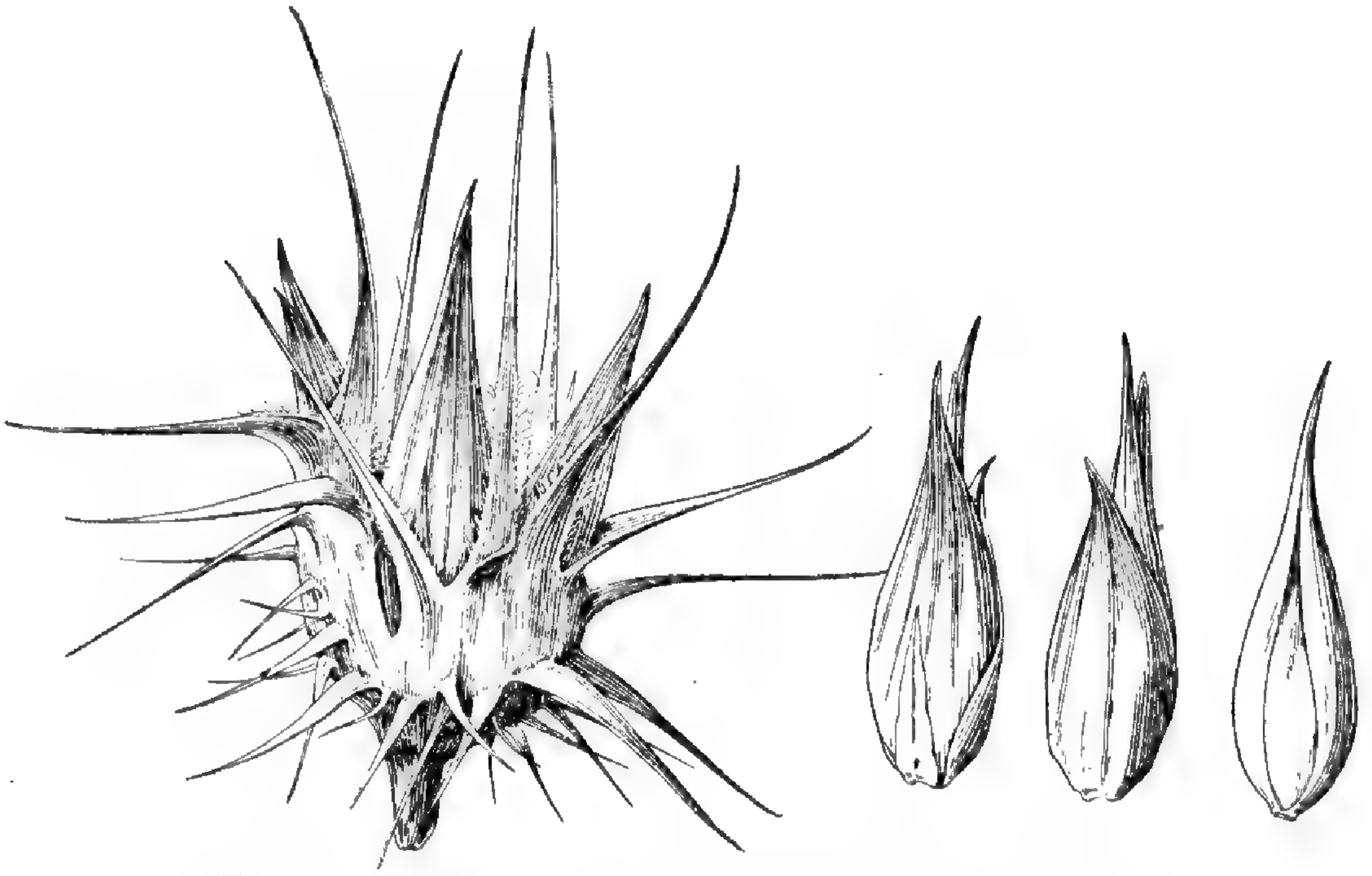

FIG. 14.—*Cenchrus gracillimus*. From the type specimen.

base, rigid and spinelike; spikelets 2 or 3, 5.5 to 7 mm. long, about 1.5 mm. wide; first glume narrow, usually present; second glume and sterile lemma attenuate-pointed, the tips often spreading, the glume about three-fourths the length of the attenuate-pointed fruit.

Cenchrus gracillimus, unlike our other species, begins blooming in the early spring. Two collections from the west coast of Florida, Tracy's nos. 6744 and 7178, represent more robust plants than is typical, with mostly flat blades and slightly larger burs. A specimen collected on Sanibel Island by A. S. Hitchcock in 1900 and the two collections from Jamaica (*Hitchcock* 9851 and *Harris* 12690) have burs very minutely puberulent.

DISTRIBUTION.

Sandy open ground and high pine land, Florida, southern Alabama, Cuba, and Jamaica.

FLORIDA: Suwanee County, *Hitchcock* 2290. Lake City, *Hitchcock* 2291. Sanford, *Hitchcock* 790. Tavares, *Hitchcock* 810. Eustis, *Curtiss* 6615; *Hitchcock* 2288, 2289; *Nash* 188, 288, 1766. Grasmere, *Combs & Baker* 1031, 1079. Zellwood, *Baker* 12. Brevard County, *Fredholm* 5826. Miami, *Amer. Gr. Nat. Herb.* 617; *Chase* 3847; *Curtiss* 5820; *Hitchcock* 629, 662; *Small & Carter* 2854. Lakeland, *Hitchcock* 829. Tampa, *Combs* 1363. Hillsborough County, *Fredholm* 6333, 6393. Dunedin, *Tracy* 6742. Cedar Key, *Tracy* 7178. Johns Pass, *Tracy* 7181. Palma Sola, *Tracy* 6744. Sanibel Island, *Hitchcock* in 1900.

ALABAMA: Mobile, *Mohr* 64.

CUBA: Isle of Pines, *Britton, Britton & Wilson* 14934.

JAMAICA: New Forest, *Hitchcock* 9851. Southern Manchester, *Harris* 12690.

9. Cenchrus incertus M. A. Curtis.

Cenchrus incertus M. A. Curtis, Bost. Journ. Nat. Hist. 1: 135. 1837. "Found at Smithville in cultivated fields," south of Wilmington, North Carolina. In the introduction to his enumeration of plants of Wilmington, Curtis states that his new species has been submitted to Dr. Torrey. In the Torrey Herbarium, in the herbarium of Columbia University, is a sheet on which are mounted a single specimen each of *C. incertus* and *C. tribuloides*, sent to Dr. Torrey by Curtis, together with the following note by Curtis: "The two plants which I send were collected near the mouth of Cape Fear river, N. C., where I observed them two seasons, and found them maintaining a uniform difference, as seen in these specimens. The one grows erect, except at the base, branching freely, and attaining the height of 12–18 inches. The other is decumbent, 4–6 inches long, and the spike of flowers never exceeding the sheaths in length, but escaping from it laterally. It is more spiny, with longer spines and more villose, with larger flowers which are more compact and fewer than the tall one. If I am not mistaken the one has two perfect flowers in the calyx and the other one. This small one appears to be *C. echinatus* var. *tribuloides*." The published description of *C. incertus* applies perfectly to the tall plant. The whereabouts of Curtis's own herbarium, if it was preserved, is not known to us.

Cenchrus strictus Chapm. Bot. Gaz. 3: 20. 1878. "West Coast of Florida, Apalachicola and southward." In the National Herbarium is a specimen from

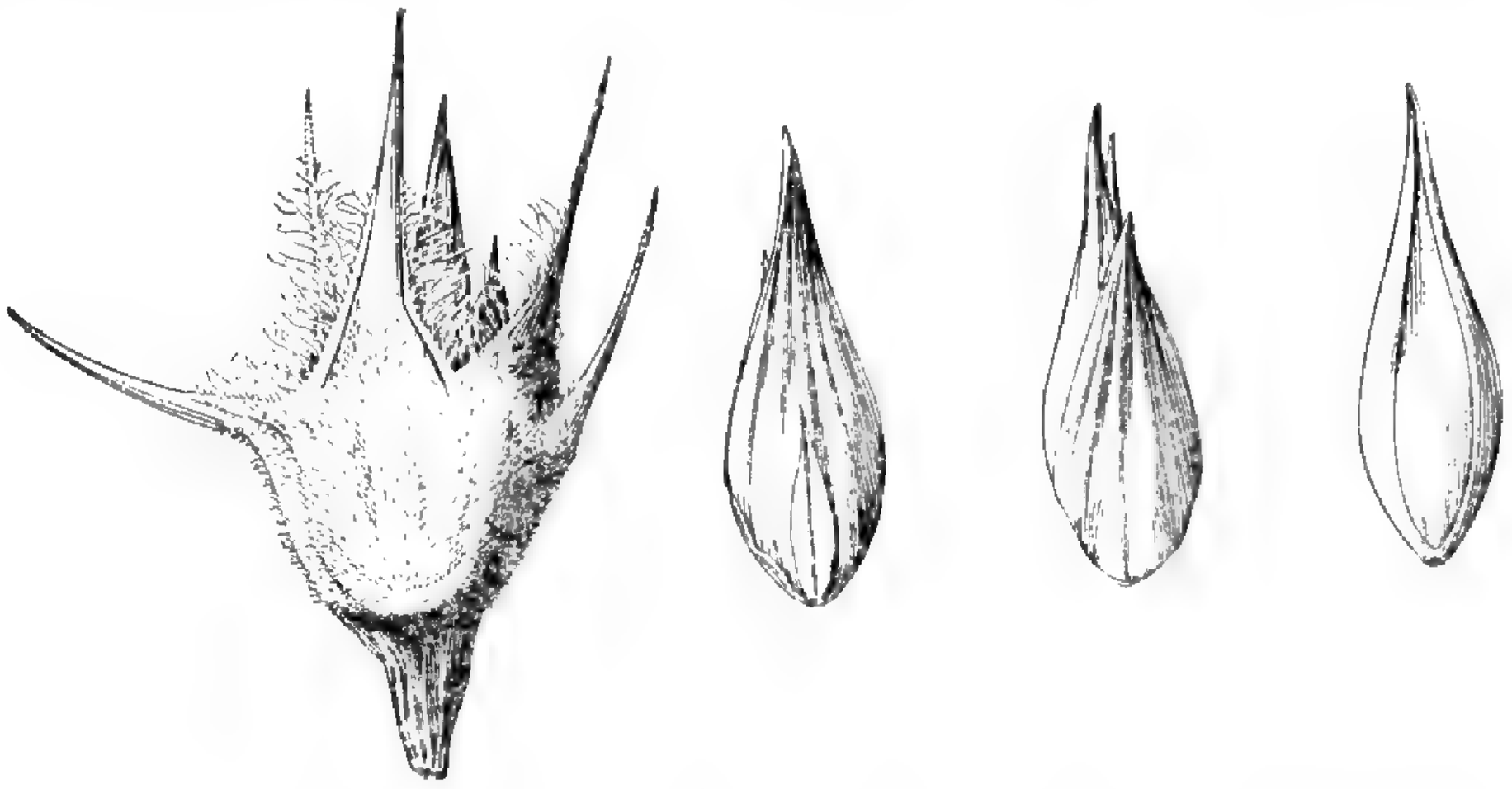

FIG. 15.—*Cenchrus incertus*. From the specimen sent by Curtis to Torrey.

Chapman's herbarium labeled in Chapman's hand, "*Cenchrus incertus*, M. A. Curtis, *C. strictus*, Chapm. in Bot. Gaz. Florida." This specimen agrees well with Chapman's description but, bearing no date, it is uncertain whether or not it is one of the plants from which Chapman drew up his description.

DESCRIPTION.

Plants perennial but apparently fruiting the first year, at length forming dense clumps, glabrous as a whole; culms 25 to 100 cm. tall, compressed, on the average stouter than those of *C. gracillimus*, scabrous (or rarely pubescent) at the summit, ascending or erect from a decumbent base, freely branching; sheaths loose and open, overlapping on the short lower internodes, often pilose near the margin toward the summit; ligule ciliate, about 0.5 mm. long; blades commonly folded, but sometimes flat, rarely stiffly flexuous as in *C. gracillimus*,

7 to 25 cm. long, 2 to 5 mm. (rarely 7 mm.) wide, scabrous on the upper surface and sparsely long-pilose, at least toward the base; spikes long-exserted or those of the branches short-exserted, 4 to 10 cm. long, the burs not crowded but on the average closer than in *C. gracillimus*, the slender axis flexuous. scabrous, sometimes pilose; burs 3 to 5 mm. wide, excluding the spines, the body finely and densely pubescent, the base glabrous; spines spreading, flat, broadened at base, the lower often obsolete on the outer face of the bur and represented by low knobs or ridges, the upper few, rarely more than 5 mm. long; body of the bur usually not deeply cleft on the outer face, the lobes commonly 5 to 7, erect to spreading, 4 to 6 mm. long, rigid and spinelike, long-ciliate at the broad base; spikelets 1 to 3, 5 to 6 mm. long, about 2 mm. wide; first glume narrow, pointed, usually present; second glume about three-fourths the length of the subequal sterile and fertile lemmas; fruit attenuate, the palea minutely puberulent toward the summit.

In this species the burs vary greatly in the development of the spines. In Curtis's specimen, from which the figure is drawn, the burs are less spiny than usual. Commonly there are one or two spines on the outer face, besides a ridge or one or two knobs at the base of the body. Occasionally the burs are as spiny as are some in *C. pauciflorus*, but the plants may be distinguished by their taller culms and erect or ascending habit, and by the glabrous, relatively long base of the bur. From *C. gracillimus* spiny specimens are distinguished by the pubescent burs.

DISTRIBUTION.

Open sandy soil, North Carolina to Florida and west to Texas.

NORTH CAROLINA: Wilmington, *Hitchcock* in 1905. Smithville, *Curtis*.

SOUTH CAROLINA: Orangeburg, *Amer. Gr. Nat. Herb.* 618.

GEORGIA: Augusta, *Kearney* 213. Leslie, *Harper* 1398. Dooly County, *Harper* 570. Brunswick, *Chase* 7093; *Ricker* 968.

FLORIDA: Jacksonville, *Curtiss* 6019. Duval County, *Fredholm* 323. St. Augustine, *Ricker* 948. Lake City, *Chase* 4280. East Pass, *Tracy* 6448. River Junction, *Nash* 2580. Apalachicola, *Biltmore Herb.* 1884. Chipley, *Combs* 610. Palm Beach, *Hitchcock* 2283. Miami, *Chase* 3854. Key Largo, *Chase* 3937. Tampa, *Fredholm* 6420. Bartow, *Combs* 1224. Fort Myers, *Standley* 13040. Punta Rassa, *Hitchcock* 446; *Standley* 12672.

ALABAMA: Springhill, *Bush* 273. Mobile, *Kearney* 59. Eufaula, *McCarthy* in 1888.

MISSISSIPPI: Biloxi, *Kearney* 210; *Tracy* 3733. Ocean Springs, *Tracy* in 1889. Chevalier Island, *Tracy* 4525. Mississippi Sound, *Smith* in 1885.

LOUISIANA: Shreveport, *Ball* 105. Alexandria, *Ball* 533. Coushatta, *Ball* 116.

TEXAS: Kerrville, *Hitchcock* 5258. New Braunfels, *Hitchcock* 5236. Austin, *Hall* 842. San Antonio, *Jermy* 171; *Hitchcock* in 1903. Rockport, *Chase* 6017. Corpus Christi, *Hitchcock* in 1904. Chillicothe, *Ball* 974. Without locality, *Drummond* 347.

10. Cenchrus microcephalus Nash.

Cenchrus microcephalus Nash in Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 356. 1917. "Type specimen in the New York Botanical Garden, collected in saline meadows, Berry Island, Bahamas, by Britton & Millspaugh (no. 2249)." This specimen consists of a single culm about 70 cm. long, single below and repeatedly branched above.

DESCRIPTION.

Plants probably perennial, tufted, with numerous leafy sterile shoots at the base, glabrous as a whole; culms 30 to 70 cm. tall, compressed, slender, scabrous below the spike, ascending from a decumbent base, branching from the middle and upper nodes; sheaths, especially those of the sterile shoots, strongly keeled, pilose on the margin toward the summit and on the shoots, with a tuft of white hairs on each side at the apex, this inconspicuous on the old sheaths; ligule ciliate, about 0.5 mm. long; blades folded at base, often flat above, rather thin, mostly 10 to 20 cm. long, 2 to 3 mm. wide, pilose on the upper surface; spikes mostly short-exserted, 3 to 5 cm. long, the slender axis flexuous, scabrous; burs (including the bristles) about 6 mm. long and 5 mm. wide, the body scarcely wider than the thick base, minutely pubescent; spines flat, broadened at base, the lowermost short and spreading, the upper stout, ciliate at the base, shorter than the 5 or 6 lobes of the involucre, these erect or ascending, ciliate nearly to the summit, rigid but relatively blunt; spikelets usually 2, 4 to 4.5 mm. long, about 1 mm. wide; first glume nearly half the length of the equal sterile lemma and fruit.

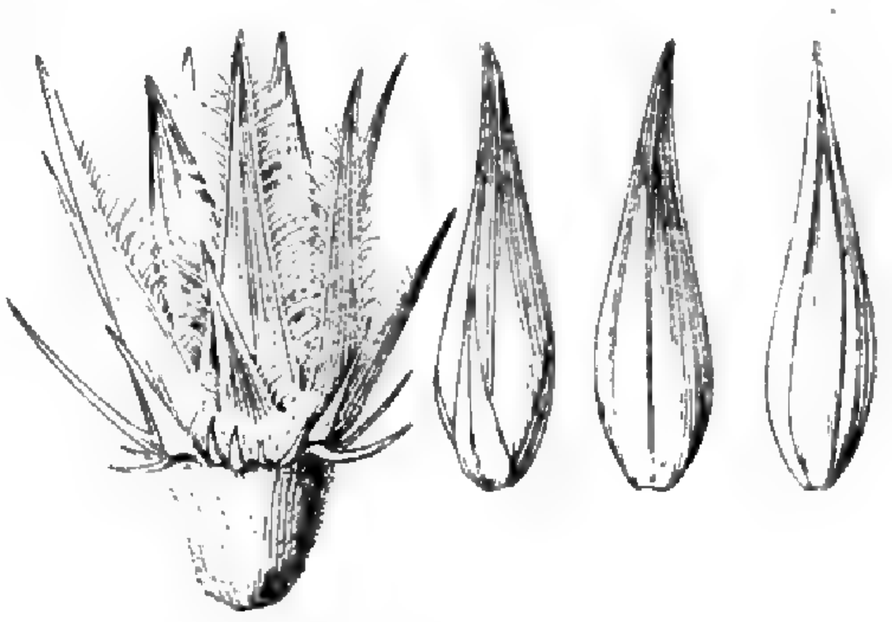

FIG. 16.—*Cenchrus microcephalus*. From the type specimen.

Known only from the Berry Islands, a second specimen having been collected on Frozen Cay (*Britton & Millspaugh* 2211).

11. Cenchrus pauciflorus Benth.

Cenchrus pauciflorus Benth. Bot. Voy. Sulph. 56. 1840. "Bay of Magdalena," Lower California. The type specimen, collected by Barclay, is in the Kew Herbarium. Doctor Stapf has kindly sent three burs from this collection. He writes that there are two sheets absolutely identical, both bearing, in Bentham's handwriting, the name and the locality as published. Two specimens from Lower California, Xantus's no. 115, from Cape San Lucas, and Brandegee's no. 3 in 1889, from Boca de las Animas, and one from Yaqui River, Sonora, Palmer's no. 11 in 1869, were sent to Doctor Stapf for comparison with plants collected by Barclay. Doctor Stapf writes: "There is no doubt that they are identical." These plants are slender, somewhat depauperate specimens with burs smaller than the average for the species. Unfortunately the type on which the name of this species is based is not typical of the species. Besides the illustration of the bur from the Barclay specimen a bur typical of the species is shown (figure 18).

Cenchrus roseus Fourn. Mex. Pl. **2**: 50. 1886. "Vera Cruz (GOUIN n. 42 part et 43)." The Gouin specimens in the herbarium of the Paris Museum were examined for us through the kindness of the director. The plants are fragmentary, with very few burs. The notes furnished on the specimens place them with little doubt in *C. pauciflorus*.

Cenchrus echinatus forma *longispina* Hack. in Kneucker, Allg. Bot. Zeitschr. **9**: 169. 1903. "Oxford in Connecticut . . . leg. E. B. Harger," no. 426 of Kneucker's "Gramineae exsiccatae." A specimen of this collection is in the National Herbarium.

This is the species to which the name *Cenchrus tribuloides* was commonly applied until 1908, when Professor Hitchcock published[1] the results of his study of the grasses in the Linnaean Herbarium, showing the Linnaean species

[1] Contr. U. S. Nat. Herb. **12**: 127. 1908.

to be the large-burred coastal plant which had been distinguished as *C. macrocephalus*. The name *C. carolinianus* Walt. was then applied to this species, but Walter's diagnosis does not agree with its characters and it has not been found in Walter's region.[1]

DESCRIPTION.

Plants annual, sometimes forming large mats; culms 20 to 90 cm. long, compressed, rather stout, scabrous or rarely pubescent at the summit, spreading, ascending or rarely suberect, from a decumbent base, usually freely branching; sheaths pubescent along the margin, rarely throughout, sometimes with a tuft of white hairs at the summit, loose, those below the spikes commonly inflated; ligule ciliate, nearly 1 mm. long; blades usually flat but sometimes subinvolute or folded, spreading, 3 to 15 cm. long, 2 to 7 mm. wide, tapering from base to apex, scabrous on the upper surface and sometimes on the lower, often pilose near the base above; spikes numerous, short-exserted or partly included, 1 to 10 cm. long (commonly 3 to 8 cm. long), the burs rather crowded, the slender axis flexuous, scabrous, sometimes pilose; burs (excluding the spines)

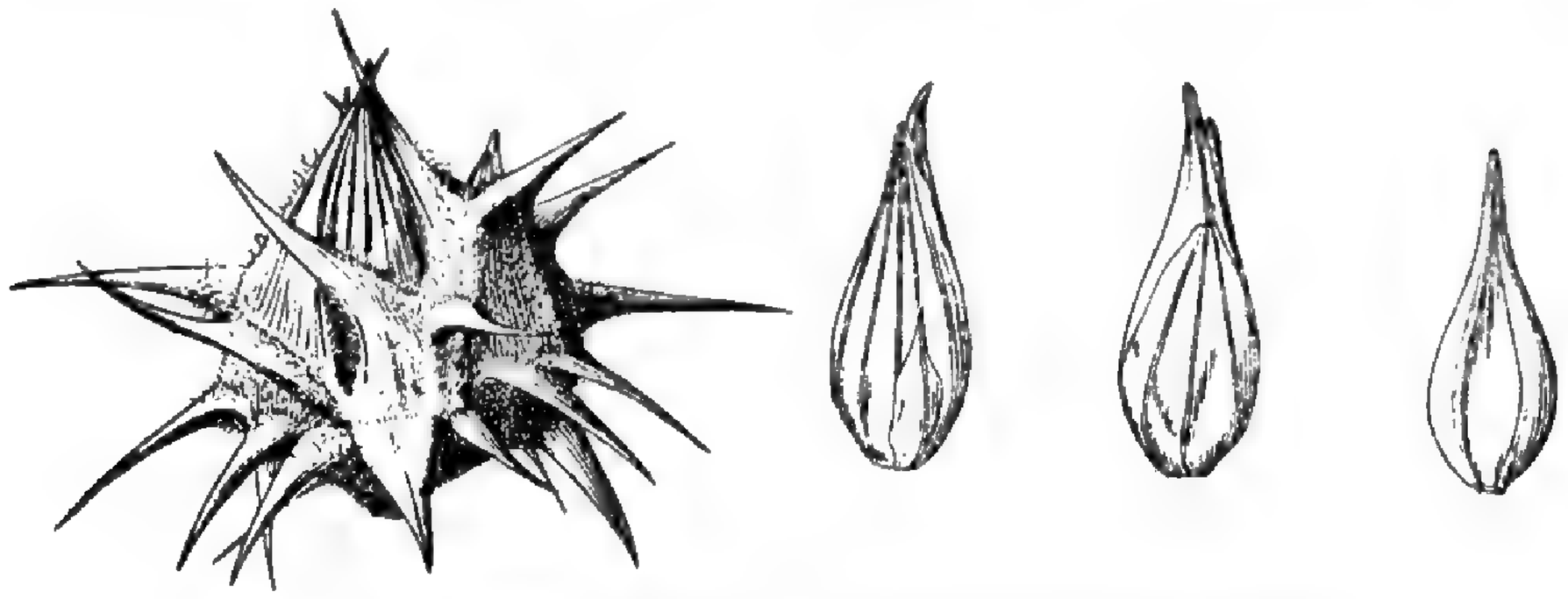

FIG. 17.—*Cenchrus pauciflorus*. From the type specimen.

3 to 7 mm. wide (commonly 4 to 6 mm.), pubescent, often densely so, rarely nearly glabrous; spines numerous, spreading or reflexed, flat, broadened at base, the lowermost shorter and relatively slender, some of the upper ones commonly 4 to 5 mm. long, usually villous at the base; body of the bur often with one deep cleft on the outer face, the lobes commonly about eight, erect or spreading or one or two inflexed, usually villous at the base, rigid and spinelike; spikelets commonly two, 5 to 7 mm. long, about 2 mm. wide; first glume usually not over one-third the length of the spikelet; second glume and sterile lemma subequal or the lemma nearly as long as the turgid acuminate-pointed fruit.

This species reaches its most characteristic development in the interior of the United States and on the Mexican plateau, where it is a coarse weed[2] in sandy ground, forming mats as much as 50 cm. in diameter. Eastward the species appears to be introduced, though it seems to be native in Florida. On the Atlantic coastal plain it is often more slender, with the blades sometimes folded, approaching *C. gracillimus* in habit. In the Colorado Desert it is sometimes dwarfed, forming mats only 3 to 5 cm. in diameter, the spikes reduced to one or two burs. In western Mexico and Central America specimens with smaller burs (about 3 mm. wide, excluding the spines) are found, besides the

[1] See discussion, p. 76.

[2] A study of the barbs on the spines of this species and a speculation as to the cause of the irritation produced by them when left in the flesh was published by Gayle (Bot. Gaz. 17: 126, 127. 1892).

relatively short-spined form represented by the type of *C. pauciflorus*. A single collection (*Hitchcock* in 1904) from Sarita, Texas, is this short-spined form. In the West Indies this species and *C. tribuloides* approach each other closely. Only specimens from the vicinity of Habana, possibly introduced, are like continental specimens. The one from the Bahamas and the one from Jamaica, particularly the latter, are like *C. tribuloides* in habit, but they have the smaller burs of *C. pauciflorus*.

Cenchrus spinifex Cav.,[1] described from Chile, has been referred to "*C. tribuloides*" as a synonym. The type has not been examined. Cavanilles's description of the "calix communis" [involucre] as "integerrimus" does not apply to any known species of *Cenchrus*. A species with interlocked lobes might, at first sight, give the impression of an uncleft body, but the most superficial examination of *C. pauciflorus* would reveal the lobes. The crude illustration shows an uncleft body with thick spines. The relatively short, broad blades described and figured are not those of *C. pauciflorus*. In the National Herbarium there are four specimens of *C. pauciflorus* from southern South America (though none from Chile), but there is nothing that agrees with Cavanilles's description and plate. The grasses of that region are as yet but little known. The identity of *C. spinifex* has been carefully considered, and it seems certain that it can not be *C. pauciflorus*. Another species described from Chile which we are unable to identify is *C. muricatus* Phil.[2] (not Linnaeus, 1771). This also is described as having entire involucres. In any case Philippi's name is a homonym.

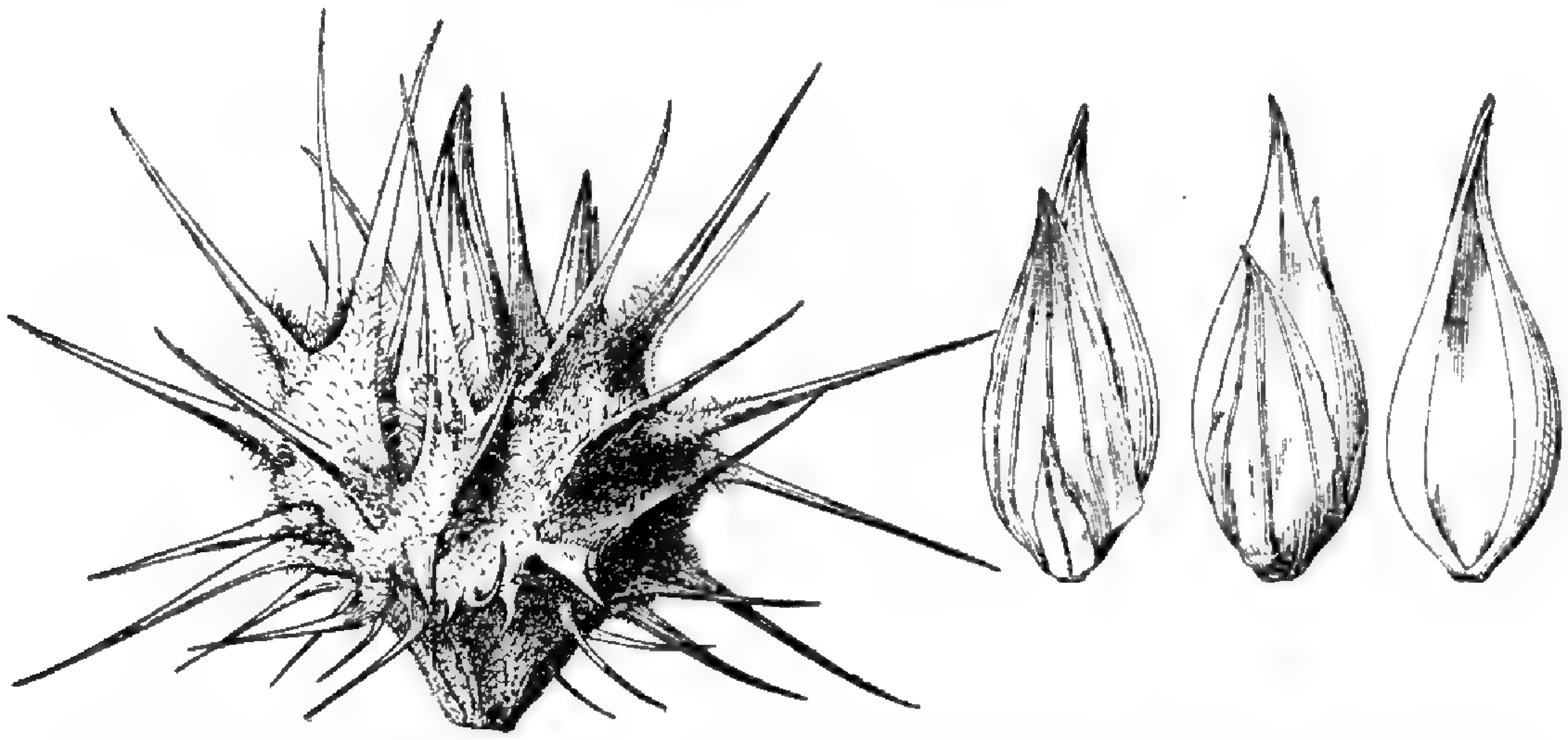

FIG. 18.—*Cenchrus pauciflorus*. From *Hitchcock* 13532; typical of the species.

DISTRIBUTION.

Sandy open ground, and along railway embankments, Massachusetts to Florida, west to Oregon and California, ascending to 2,000 meters in the Rocky Mountains, south throughout Mexico, mostly on the plateau, rare in the tropical part of the continent, and appearing again from southern Brazil to Argentina; also in the West Indes.

ONTARIO: Leamington, *Macoun* 63.
MASSACHUSETTS: South Hadley, *Clark* in 1887.
CONNECTICUT: South Glastonbury, *Wilson* 28.
NEW YORK: Erastina, *Pollard* in 1894. Northville, *Young* in 1873.

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[1] Icon. Pl. 5: 38. *pl. 461*. 1799.
[2] Anal. Univ. Chile 36: 202. 1870.

NEW JERSEY: Camden, *Scribner* 122. Stockholm, *Van Sickle* in 1894. Stockton, *Fisher* in 1897.

PENNSYLVANIA: Easton, *Porter* in 1868. Lancaster County, *Small* in 1889; *Heller* in 1901.

OHIO: Toledo, *Sanford* 6780. Kipton, *Ricksecker* in 1894. Fernbank, *Kearney* in 1892.

INDIANA: Lake Gage, *Deam* in 1903. Ontario, *Deam* 15054. Waterloo, *Deam* in 1904. Fort Wayne, *Deam* 1323. Bluffton, *Deam* in 1896. Miller, *Umbach* in 1897. Indiana Harbor, *Deam* 1397. Conrad, *Deam* 21525. Russellville, *Deam* 7443. Martinsville, *Deam* 2673. Brookville, *Deam* in 1903. Kinderhook Ferry, *Deam* 25576.

ILLINOIS: Chicago, *Chase* 1167; *Lansing* 3990. Joliet, *Skcels* 508. Forest, *Wilcox* 136. Champaign, *Gleason* 25. Wady Petra, *V. H. Chase* 1929. Mount Carmel, *Schneck* in 1904. Cahogia, *Eggert* in 1875.

MICHIGAN: St. Joseph, *Gamon* in 1897.

WISCONSIN: Quincy, *Cheney* 3747. Oshkosh, *Random* in 1896.

MINNESOTA: Fort Snelling, *Mearns* 5. Montevideo, *Moyer* 26. Minneapolis, *Ballard* in 1893. St. Anthony Park, *Oswald* in 1911.

NORTH DAKOTA: Bismarck, *Lunell* in 1913.

SOUTH DAKOTA: Pierre, *Griffiths* 30. "Island in the Missouri River," *Griffiths* 34. Bad Lands, *Williams* in 1891.

IOWA: Fayette County, *Fink* 359. Ames, *Ball* 12; *Pammel*, Amer. Weeds 27. Des Moines, *Pammel* 657. Butlers Landing, *Somes* 3482.

NEBRASKA: Central City, *Rydberg* 2015; *Shear* 257. Chelsea, *Clements* 2827. Mullen, *Rydberg* 1548.

MISSOURI: Springfield, *Standley* 8996. Kansas City, *Bush* 6497. Frankford, *Davis* 1140.

KANSAS: Fort Riley, *Gayle* 582. Syracuse, *Thompson* 82. Manhattan, *Hitchcock* 10411. Riley County, *Norton* 577. Hutchinson, *Smyth* 25. Osborne City, *Shear* 163.

MARYLAND: Millstone, *Hitchcock* 7873.

DISTRICT OF COLUMBIA. Deanwood, *Amer. Gr. Nat. Herb.* 614.

NORTH CAROLINA: Wilmington, *Biltmore Herb.* 146b; *Hitchcock* in 1905.

GEORGIA: Darien, *Smith* 2149.

FLORIDA: Jacksonville, *Combs* 38; *Curtiss* 82, 3620, 5151, 5193, 6020. St. Augustine, *Chase* 7019. Lake City, *Combs & Rolfs* 185; *Quaintance* 852. DeFuniak Springs, *Combs* 453. Apalachicola, *Kearney* 112. Madison, *Combs* 245. Tallahassee, *Combs* 364; *Kearney* 81. Pensacola, *Combs* 513. Old Town, *Combs* 891. Dunedin, *Tracy* 6743. Cedar Key, *Combs* 763. Seabreeze, *Webber* 489. Eustis, *Hitchcock* 2282, 2285; *Nash* 364, 2101. McDonald Station, *Baker* 59. Grasmere, *Combs & Baker* 1078. Palm Beach *Hitchcock* 2284, 2287; *Webber* 416. Miami, *Hitchcock* 722; *Small* 5464. Key Largo, *Chase* 3939. Upper Matecumbe Key, *Chase* 3919. Elliotts Key. *Pollard & Collins* 213. Key West, *Hitchcock* 612. Okeechobee, *Fredholm* 5826. Fort Myers, *Hitchcock* 447, 852. Palmetto, *Nash* 2444.

KENTUCKY: Louisville, *Mohr* in 1854.

TENNESSEE: "Bank of the Mississippi River," *Scribner.*

ALABAMA: Mobile, *Hitchcock* in 1904. Tuskegee, *Carver* 80.

MISSISSIPPI: Biloxi, *Tracy* in 1893.

LOUISIANA: Cameron, *Tracy* 8595. Calhoun, *Ball* 50. Shreveport, *Hitchcock* in 1903. Lake Charles, *Chase* 6112.

TEXAS: Texarkana, *Heller* 4211. Texline, *Griffiths* 5667. Cibolo, *Jermy* 174. New Braunfels, *Hitchcock* 5206. San Antonio, *Hitchcock* 5154, 5322, 5324. Fort Worth, *Ruth* 166. Rockport, *Chase* 6061. Galveston, *Hitchcock* in

1903. Corpus Christi, *Hitchcock* 5344; *Heller* 1492. Sarita, *Hitchcock* 5425, 5439, 5473, 5481. Del Rio, *Hitchcock* 13647, 13664. Laredo, *Hitchcock* 5501, 5502, 5509. La Noria, *Mearns* 1162. Fort Clark, *Mearns* 1217. Big Spring, *Hitchcock* 13352, 13398. El Paso, *Hitchcock* 13334. Southwestern Texas, *Palmer* 1242 in 1880.

OKLAHOMA: Between Fort Cobb and Fort Arbuckle, *Palmer* 385 in 1868. Arkansas, *Bush* 745. Alva, *Stevens* 768.

WYOMING: Uva, *Nelson* 8568.

OREGON: Willows, *Dunn*, 181. Linnton, *Suksdorf* 1994.

COLORADO: Fort Collins, *Brose* 530. Canon City, *Shear* 963. Rocky Ford, *Griffiths* 3315. Colorado Springs, *Williams* 2168.

UTAH: Springdale, *Jones* 6079.

NEW MEXICO: Artesia, *Hitchcock* 13451. Queen, *Hitchcock* 13532. Mesilla Park, *Hitchcock* 3823. Las Cruces, *Wooton* 1088. Sandia Mountains, *Ellis* 14. Shiprock Agency, *Standley* 7244. Farmington, *Standley* 7047. Nara Visa, *Fisher* 161. Gila Hot Springs, *Metcalfe* 880. Black Range, *Metcalfe* 1148. Pecos, *Standley* 4947. Socorro, *Vasey* in 1881. Albuquerque, *Jones* 4123. Without locality, *Fendler* 983.

ARIZONA: Holbrook, *Rusby* 8. Prescott, *Hitchcock* 13187. Patagonia, *Hitchcock* 3705. Verde Valley, *MacDougal* 523. Clifton, *Davidson* 413a. Fort Lowell, *Griffiths* 1560.

CALIFORNIA: Mecca, *Parish* in 1913. San Bernardino, *Parish* 2114 and in 1893; *Abrams* 1960.

LOWER CALIFORNIA: Cape St. Lucas, *Xantus* 115. Boca de las Animas, *Brandegee* 3 in 1889. San José del Cabo, *Brandegee* 27 in 1890.

SONORA: Yaqui River, *Palmer* 11 in 1869. Hermosillo, *Hitchcock* 3578. Alamos, *Rose, Standley & Russell* 12837. Guaymas, *Palmer* 168 and 349 in 1887; *Rose, Standley & Russell* 15019.

CHIHUAHUA: Casas Grandes, *Nelson* 6327. Chihuahua, *Hitchcock* 7788.

COAHUILA: Jaral, *Schumann* 1730. Saltillo, *Hitchcock* 5628.

NUEVO LEÓN: Monterrey, *Hitchcock* 5523.

TAMAULIPAS: Victoria, *Palmer* 396 in 1907, 156 in 1910. Tampico, *Hitchcock* 5792.

SAN LUIS POTOSÍ: Cárdenas, *Hitchcock* 5733. San Luis Potosí, *Hitchcock* 5654, 5699; *Schaffner* 1046.

DURANGO: Durango, *Hitchcock* 7575; *Palmer* 196 in 1896. Torreón, *Hitchcock* 7559.

SINALOA: Mazatlán, *Rose, Standley & Russell* 13794.

TEPIC: Acaponeta, *Rose, Standley & Russell* 14407.

AGUASCALIENTES: Aguascalientes, *Hitchcock* 7440, 7470.

JALISCO: Guadalajara, *Hitchcock* 7292. Tecomán, *Orcutt* 4446.

HIDALGO: Tula, *Rose, Painter & Rose* 8361.

QUERÉTARO: Querétaro, *Basile* 28; *Hitchcock* 5825, 5841; *Agniel* 10259.

COLIMA: Manzanillo, *Hitchcock* 7049. Armeria, *Hitchcock* 7023, 7047.

FEDERAL DISTRICT: Popo Park, *Hitchcock* 6025, 6688½.

PUEBLA: Tehuacán, *Hitchcock* 6045, 6068½; *Seler* 7.

VERACRUZ: Mata de San Juan, *Liebmann* 473. Veracruz, *Hitchcock* 6575.

GUERRERO: Acapulco, *Palmer* 290 in 1895.

OAXACA: Tomellín, *Hitchcock* 6204, 6218, 6249. Oaxaca, *Hitchcock* 6128; *Nelson* 1291. Santa Catarina Canyon, *Pringle & Conzatti* 274.

YUCATÁN: Alacrán Shoal, *Millspaugh* 1756.

QUINTANA ROO: Cozumel Island, *Millspaugh* 1607.

NICARAGUA: Corinto, *Hitchcock* 8618.

COSTA RICA: Puntarenas, *Hitchcock* 8540.
PANAMA: Point Chamé, *Hitchcock* 8164.
CUBA: Habana, *León* 188½, 836, 2391, 3445, 3453; *Palmer & Riley* 1146. Triscornia, *Hitchcock* 492. Playa de Cojimar, *Hitchcock* 493. Without locality, *Wright* 3476.
JAMAICA: Black River, *Hitchcock* 9637.
PORTO RICO: Santurce, *Chase* 6345½.
VIRGIN ISLANDS: St. Thomas, *Raunkiaer* 634.
LEEWARD ISLANDS: Antigua, *Wullschlaegel* 634.
BRAZIL: Rio Janeiro, *Wilkes Expl. Exped.; Warming* in 1863.
URUGUAY: Costa Platense, *Arechavaleta.*
ARGENTINA: Córdoba, *Stuckert* in Kneucker Gram. Exs. 427. Without locality, *Lorentz* 697; *Jorgensen* 1147.

12. Cenchrus tribuloides L.

Cenchrus tribuloides L. Sp. Pl. 1050. 1753. "Habitat in Virginiae maritimis." The type specimen in the Linnaean Herbarium,[1] marked "K," indicating that it was collected by Kalm, consists of two branching plants.

Cenchrus echinatus tribuloides Torr. Fl. North. & Mid. U. S. 1: 69. 1823. Based on *C. tribuloides* L.

Cenchrus vaginatus Steud. Syn. Pl. Glum. 1: 110. 1854. "Culta in horto Paris: sub. Cenchrus tribuloides macrocarpus." This specimen has not been examined, but the detailed description applies remarkably well to the true *C. tribuloides.*

Cenchrus tribuloides macrocarpus Steud. Syn. Pl. Glum. 1: 110. 1854. A garden name given as synonym of *C. vaginatus* Steud.

Cenchrus tribuloides var. *macrocephalus* Doell in Mart. Fl. Bras. 2³: 312. 1877. Described from a specimen in Martius's herbarium, "e Brasilia oriunda." The type has not been examined, but the brief description can refer to nothing else known to us. The involucre, described as less villous than that of *C. tribuloides,* would indicate an exceptional specimen, such as Chase's no. 4531 from South Carolina and several of the West Indian specimens.

Cenchrus macrocephalus Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 17: 110. *f. 406.* 1899. Based on *C. tribuloides* var. *macrocephalus* Doell.

DESCRIPTION.

Plants annual, very leafy; culms stout, at first erect, soon branching and becoming radiate-decumbent, 15 to 60 cm. long, the ends ascending, rooting at the nodes and with numerous ascending branches 10 to 30 cm. tall, scabrous or pilose at the summit; sheaths usually much overlapping, sharply keeled, broad, those below the spikes inflated, pubescent at least along the margin and with a dense tuft of hairs on each side at the summit; ligule ciliate, 1 mm. long; blades flat or folded, the margins usually more or less involute, firm, spreading, 3 to 18 cm. long (seldom over 12 cm. long), 4 to 7 mm. wide, tapering from base to apex, scabrous on the upper surface; spikes numerous, usually exceeded by the subtending leaf, 3 to 9 cm. long, the burs crowded, the axis flexuous, scabrous or pilose; burs more oblique than in any other of our species, 5 to 6 mm. wide and 8 to 9 mm. high (excluding the spines), usually conspicuously villous, but sometimes short-pubescent only, the base puberulent, usually with a few long hairs at the very base; spines finally spreading, flat, the lowermost relatively short and slender, the upper ones broadened at the base, some-

[1] See p. 45.

times as much as 3 mm., broad, some of them 5 to 8 cm. long, long-villous on the inner face and margins of the broad base, the hairs of the margin rather stiffly spreading, the ends needle-like and retrorsely barbed; body of the bur with no deep cleft on the outer face, the tips of the spikelets usually not showing above the base of the clefts, the lobes six to eight, mostly about equal and simulating the larger spines, erect to spreading, villous on the inner face and on the margins at the base like the spines, the outer surface glabrous or nearly so above the base; spikelets usually two, 7 to 8 mm. long, about 3 mm. wide; first glume about one-third the length of the spikelet; second glume sometimes minutely puberulent on the lower part of the middle internerves, slightly shorter than the sterile lemma, this slightly shorter than the acuminate-pointed fruit.

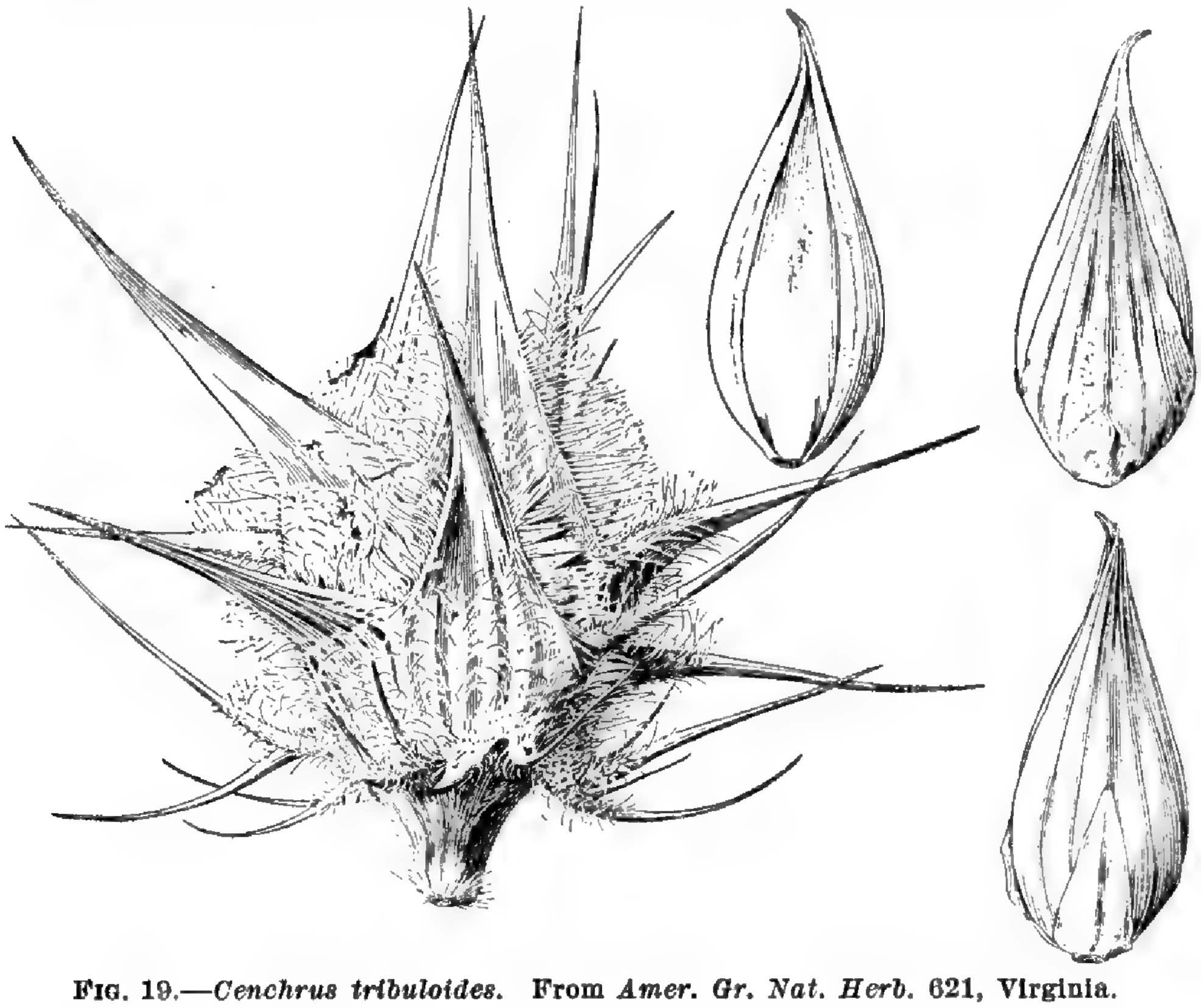

FIG. 19.—*Cenchrus tribuloides*. From *Amer. Gr. Nat. Herb.* 621, Virginia.

Cenchrus tribuloides usually is readily recognizable by its short-jointed, leafy, decumbent culms and large woolly burs. In *Chase* 4531 from South Carolina and in most of the specimens from the West Indies, however, the burs are not conspicuously villous, the pubescence being scarcely or not at all longer or more copious than in *C. pauciflorus*. In the specimen from Costa Rica the burs are nearly glabrous. Because of the habit of the plants and because of their large burs, with bodies not deeply cleft and with hidden or nearly hidden spikelets, these specimens are referred to *C. tribuloides*. In *Shafer* 2737 from Cuba, *Millspaugh* 1162 from Cayman Brac, and *Chase* 6561 from Porto Rico, the burs are scarcely larger than in extreme specimens of *C. pauciflorus*, and some of them are slightly cleft, showing the upper part of the spikelets. It is a puzzling fact that in the West Indies, at the eastern edge of the range of *C. tribuloides*, this species and *C. pauciflorus*, whose center of distribution is far to the west of that of *C. tribuloides*, approach each other, while in the Gulf States, where their ranges meet, they do not.

DISTRIBUTION.

In loose sands of the coast from Staten Island, New York, to Florida and Louisiana; on the Atlantic coast of Costa Rica, in the West Indies, and on the coast of Brazil.

NEW YORK: Staten Island, *Kearney* in 1894.

NEW JERSEY: Camden, *Smith* 64. Atlantic City, *Scribner* in 1895. Wildwood, *Chase* 3506. Cape May, *Parker* in 1871; *Martindale* in 1877.

DELAWARE: Rehoboth, *Commons* 144 in 1895. Cedar Neck, *Commons* 143 in 1875.

MARYLAND: Chesapeake Beach, *Hitchcock* in 1905; *Pennell* 2541 and in 1909. Millstone, *Hitchcock* 7871. Mount Vernon, *Tidestrom* 7464. Annapolis, *Bartlett* 1862.

VIRGINIA: Colonial Beach, *Hubbard* 398. Franklin, *Heller* 1170. Cape Charles, *Canby & Rose* 837. Cape Henry, *Amer. Gr. Nat. Herb.* 621; *Kearney* 1813, 1814. Virginia Beach, *Hitchcock* in 1902; *Williams* 3108. Fortress Monroe, *McCarthy* in 1884. Portsmouth, *Noyes* 24. Dismal Swamp, *Chase* 3665.

NORTH CAROLINA: Newbern, *Kearney* 1948. Greenville, *Chase* 4573; *Hitchcock* in 1905. Wilmington, *Kearney* 286. Eastern North Carolina, *McCarthy* in 1885.

SOUTH CAROLINA: Isle of Palms, *Chase* 4531; *Hitchcock* in 1905.

GEORGIA: Tybee Island, *Hitchcock* in 1902.

FLORIDA: Miami, *Westgate* in 1904. Elliotts Key, *Pollard & Collins* 213. Soldier Key, *Small, Carter & Small* 3300. Sanibel Island, *Tracy* 7172. St. Vincent Island, *McAtee* 1800.

ALABAMA: Mobile, *Mohr* in 1878. Navy Cove, *Mohr* in 1888. Point Clear, *Mohr* in 1879 and in 1885.

MISSISSIPPI: Horn Island, *Tracy* in 1897. Deer Island, *Tracy* 140. Ship Island, *Pollard* 1088. Ocean Springs, *Pollard* 1022. Biloxi, *Tracy* 4526.

LOUISIANA: Grande Isle, *Langlois* in 1879.

COSTA RICA: Boca Banana, *Tonduz* 9121.

BERMUDA: *Collins* 143. Paget, *Brown & Britton* 128. Middleton Bay, *Moore* 3073.

BAHAMAS: Andros, *Small & Carter* 8972. Water Key, *Wilson* 8151. Anguilla Isles, *Wilson* 7936.

CUBA: Playa de Marianao, *León* 5634. Punta Arenas, *Shafer* 700. Cayo Paredón Grande, *Shafer* 2737.

JAMAICA: Grand Cayman, *Millspaugh* 1249. Cayman Brac, *Millspaugh* 1162.

PORTO RICO: Arecibo, *Chase* 6561. Aguadilla, *Chase* 6604. Cabo Rojo, *Sintenis* 29 b. Mona Island, *Hess* 440. Cayo Muertos, *Britton, Cowell & Brown* 5046. Vieques, *Chase* 6696.

BRAZIL: Rio Janeiro, *Jard. Bot. Rio Janeiro* 132.

13. Cenchrus palmeri Vasey.

Cenchrus palmeri Vasey in T. S. Brandeg. Proc. Calif. Acad. II. **2**: 211. 1889. "Collected by Dr. E. Palmer at Guaymas, Mex., in 1887." The type specimen, Palmer's no. 689, in the National Herbarium, is a single branching tuft, the culms 30 to 42 cm. tall, the burs 1 or 2 to each spike, their spines blackish purple.

DESCRIPTION.

Plants annual, leafy; culms rather slender, compressed, scabrous below the nodes, pubescent at the summit, at first erect, soon branching and spreading, 12 to 42 cm. tall; sheaths mostly overlapping, loose, retrorsely velvety-pubescent,

the hairs longer and denser at the summit; ligule ciliate, 2 to 2.5 mm. long; blades mostly flat, rather firm, ascending or spreading, 3 to 18 cm. long, 3 to 7 mm. wide, tapering from the base to an attenuate apex, very scabrous on both surfaces; spikes reduced to 1 to 4 burs, commonly 1 or 2, the terminal spikes mostly long-exserted, those of the branches overtopped by the subtending leaf;

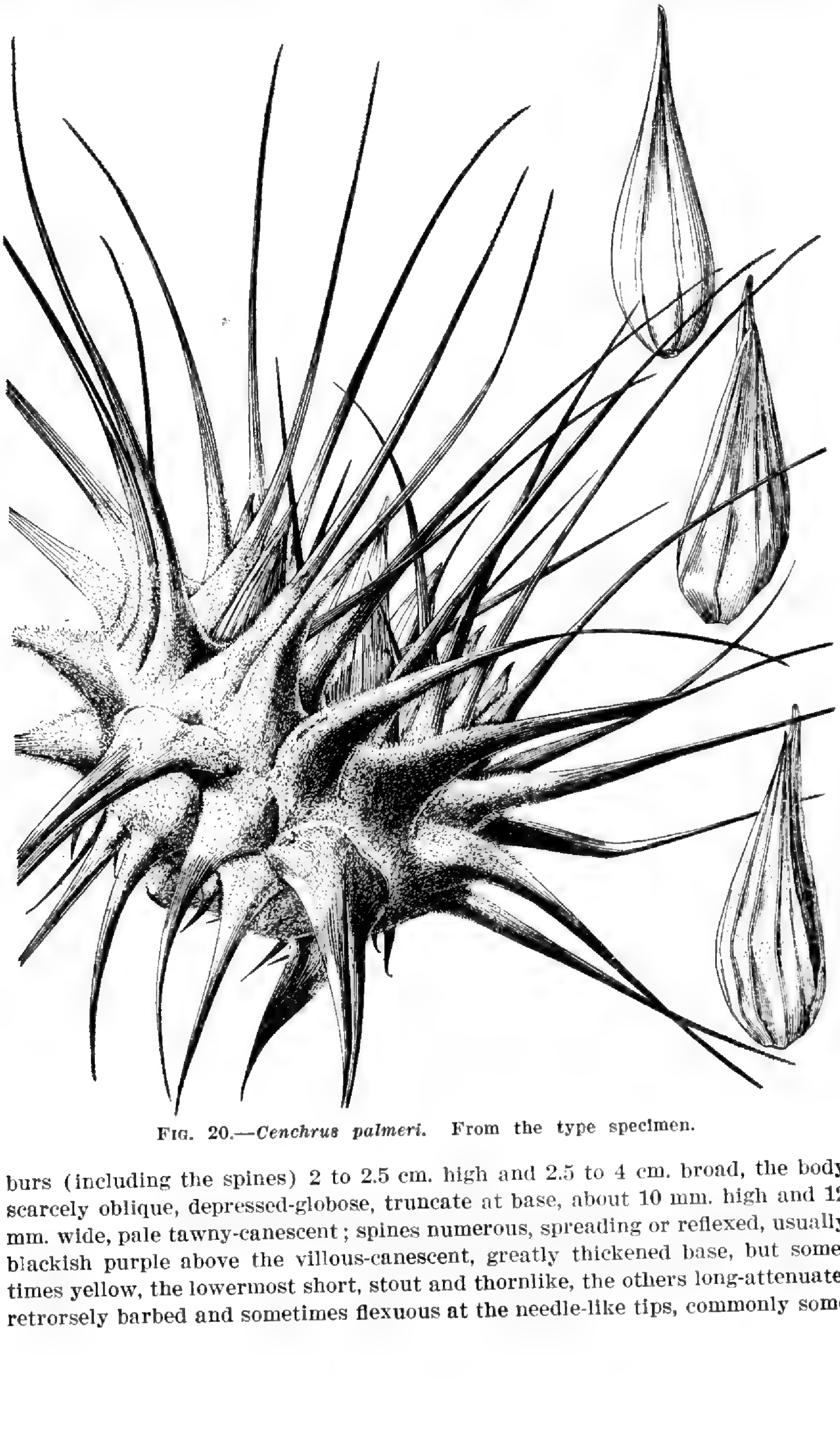

FIG. 20.—*Cenchrus palmeri.* From the type specimen.

burs (including the spines) 2 to 2.5 cm. high and 2.5 to 4 cm. broad, the body scarcely oblique, depressed-globose, truncate at base, about 10 mm. high and 12 mm. wide, pale tawny-canescent; spines numerous, spreading or reflexed, usually blackish purple above the villous-canescent, greatly thickened base, but sometimes yellow, the lowermost short, stout and thornlike, the others long-attenuate, retrorsely barbed and sometimes flexuous at the needle-like tips, commonly some

of them divided in two part way or to the base, and some 12 to 15 mm. long; body of the bur thick-walled, the lobes mostly 12 to 15, erect or spreading, similar to the spines; spikelets 4 to 7, more or less distorted by the pressure of the rigid involucre, 7 to 9 mm. long, 2 to 3 mm. wide; first glume very narrow, usually wanting; second glume and sterile lemma slightly shorter than the acuminate fruit, obscurely puberulent on the middle internerves.

The bur of *C. palmeri* is larger than that of any other known species of the genus. A second specimen of *Palmer* 689 with yellow-spined burs is mentioned by Vasey in the original description as a "yellow colored variety."

DISTRIBUTION.

In dry sands near the coast, Sonora and Lower California, Mexico.

LOWER CALIFORNIA: Carmen Island, *Palmer* 14 in 1870, 865 in 1890. Calmallí, *Orcutt* in 1899. Magdalena Bay, *Brandegee* in 1889. San José del Cabo, *Purpus* 519. San Felipe, *Goldman* 1161. Between Santo Domingo and Matancita, *Nelson & Goldman* 7276.

SONORA: Guaymas, *Palmer* 271 and 689 in 1887. Adair Bay, *Sykes* 58.

DOUBTFUL SPECIES.

The following names, based on North American plants, the writer has not been able to identify:

CENCHRUS CAROLINIANUS Walt. Fl. Carol. 79. 1788. No locality is given, but so far as known Walter's plants were collected in the vicinity of his home, which was on the south side of the Santee River, in the northern part of Berkeley County, South Carolina, to the east of Eutaw Springs, and near the mouth of the old Santee Canal[1]. No specimen of *Cenchrus* was found in the Walter Herbarium, now in the British Museum[2]. The brief diagnosis is as follows: "Involucrum echinatum biflorum, spica glomerata, glumis globosis muricato-spinosis laevibus." This was meant apparently to distinguish the species from Linnaeus's "glumis femineis globosis muricato-spinosis hirsutis," that is, *C. tribuloides*. Walter's diagnosis does not apply to any known species. Our only species with smooth burs is *C. gracillimus*, which is not found north of Florida. When the American grasses in the Linnaean Herbarium were examined by A. S. Hitchcock in 1907, it was found that *C. tribuloides* was the coast form currently called *C. macrocephalus*. The name *C. carolinianus* was then applied to the common inland species previously known as *C. tribuloides*. That species, however, is not known to occur in South Carolina. It has been found in North Carolina and Georgia but appears there to be an introduced weed. Two species of *Cenchrus* are known from South Carolina, *C. tribuloides*, confined to the coast, and *C. incertus* in the coastal plain. Of these two only *C. incertus* is known to occur in Walter's region. His statement "glumis [bur] laevibus" better applies to *C. incertus* with its finely pubescent burs than to *C. tribuloides* with conspicuously villous burs. Since the diagnosis is inadequate and the type specimen nonexistant, the name can not be applied with certainty and is therefore rejected.

CENCHRUS GRACILIS Beauv. Ess. Agrost. 57, 157. 1812. A name only for a specimen sent by Bosc, presumably from the Carolinas.

CENCHRUS HIRSUTUS Spreng. Neu. Entd. **3**: 15. 1822. "Hispaniola." The description, which suggests a species of *Pennisetum* rather than *Cenchrus*, does not agree with any species known to us.

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[1] See Brainerd, Bull. Charleston Mus. **3**: 33. 1907.

[2] See Hitchcock, Ann. Rep. Mo. Bot. Gard. **16**: 48. 1905.

EXCLUDED SPECIES.

The following names at some time included in *Cenchrus* comprise only those based on American material or those of species which occur in America:

Cenchrus aegyptius (L.) Beauv.=*Dactyloctenium aegyptium* (L.) Richt.
Cenchrus granularis L.=*Rytilix granularis* (L.) Skeels.
Cenchrus hilarii Raspail=*Hilaria cenchroides* H. B. K.
Cenchrus inflexus Poir.=*Echinolaena inflexa* (Poir.) Chase.
Cenchrus laevigatus Trin.=*Anthephora hermaphrodita* (L.) Kuntze.
Cenchrus marginalis Rudge=*Echinolaena inflexa* (Poir.) Chase.
Cenchrus multiflorus Presl=*Pennisetum* sp.
Cenchrus mutilatus (Hack.) Kuntze=*Pennisetum mutilatum* Hack.
Cenchrus nervosus (Nees) Kuntze=*Pennisetum nervosum* (Nees) Trin.
Cenchrus parviflorus Poir. is an unknown species, probably *Chaetochloa geniculata* (Lam.) Millsp. & Chase.
Cenchrus racemosus L.=*Nazia racemosa* (L.) Kuntze.
Cenchrus setosus Swartz=*Pennisetum setosum* (Swartz) L. Rich.
Cenchrus spicatus (L.) Kuntze=*Pennisetum glaucum* (L.) R. Br.
Cenchrus tripsacoides Cav.=*Anthephora hermaphrodita* (L). Kuntze.
Cenchrus tristachyus (H. B. K.) Kuntze=*Penniscetum tristachyum* (H. B. K.) Spreng.
Cenchrus villosus Spreng.=*Anthephora hermaphrodita* (L.) Kuntze.
Cenchrus villosus (R. Br.) Kuntze=*Pennisetum villosum* R. Br.

INDEX.

[Page numbers of principal entries in heavy-face type. Synonyms in italic.]

Page.

Amongeaba ---- 47, 49
Anthephora hermaphrodita ---- 77
Axonopus ---- 33
Brachiaria ---- **33**, 35
brizantha ---- 35
ciliatissima ---- **35**, 38, 39
digitarioides ---- 43
erucaeformis ---- **33**, 34, 35, 36, 37
falcifera ---- 35
gilesii ---- 35
meziana ---- **39**, 40
milliformis ---- 35
obtusa ---- 43
ophryodes ---- **37**, 38, 39
plantaginea ---- **41**, 42
platyphylla ---- **40**, 41, 42
prostrata ---- 43
Cenchropsis ---- 49
myosuroides ---- 52
Cenchrus ---- **45**, 46, 47, 48, 50
aegyptius ---- 77
alopecuroides ---- 52
annularis ---- 54
australis ---- 50
brevisetus ---- 59
capitatus ---- 48, 49
carolinianus ---- 49, 68, 76
catharticus ---- **50**, **53**, 54
dactylolepis ---- 57
distichophyllus ---- **54**, 55
echinatus ---- **46**, **47**, **48**, **49**, **58**, **59**, 62, 63
forma *longispina* ---- 67
var. *brevisetus* ---- 59
var. *tribuloides* ---- 65, 72
var. *viridis* ---- 57
elliottii ---- 52
frutescens ---- 48, 49
gracilis ---- 76
gracillimus ---- **63**, **64**, 65, **66**, 68, 76
granularis ---- 77
hilarii ---- 77
hirsutus ---- 76
incertus ---- **65**, 76
inflexus ---- 77
insularis ---- **62**, 63
laevigatus ---- 77
macrocarpus ---- 59
macrocephalus ---- 68, 72, 76
marginalis ---- 77
microcephalus ---- **66**
multiflorus ---- 59, 77
muricatus ---- 69
mutilatus ---- 77
myosuroides ---- 46, 49, **52**, 59
nervosus ---- 77
niloticus ---- 54
pallidus ---- 55, 56, 59
palmeri ---- 50, **74**, 75, 76

Page.

Cenchrus *parviflorus* ---- 77
pauciflorus ---- 46, 47, **51**, 59, 66, **67**, 68, 69, 73
pilosus ---- 50, **55**, 56, 59
pungens ---- 58
racemosus ---- 48, 49, 77
rigidus ---- 57
roseus ---- 67
setoides ---- 52
setosus ---- 77
spicatus ---- 77
spinifex ---- 46, 69
strictus ---- 65
tribuloides ---- 46, 47, 48, 65, 67, 69, **72**, 73, 76
var. *macrocarpus* ---- 72
var. *macrocephalus* ---- 72
tristachyus ---- 77
tristachyus ---- 77
vaginatus ---- 72
villosus ---- 77
viridis ---- **57**, 59
var. *macrocephalus* ---- 57
Chaetochloa ---- 34
geniculata ---- 77
Chamaeraphis ---- 50
Dactyloctenium aegyptium ---- 77
Digitaria (section of Panicum) ---- 34
Echinaria ---- 49
capitata ---- 47, 48
Echinochloa ---- 1, 34
crucaeformis ---- 36
Echinolaena inflexa ---- 77
Eriochloa ---- 33
Harpostachys (section of Panicum) 34
Hilaria cenchroides ---- 77
Hymenachne ---- 34
Ichnanthus ---- **1**
alsinoides ---- 4
apiculatus ---- 12
axillaris ---- 7, 8
glaber ---- **10**
ichnodes ---- **1**, **11**, 12
lanceolatus ---- **8**, 9
leiocarpus ---- **10**
martianus ---- 9
mayarensis ---- **3**
mexicanus ---- **10**, 11
nemoralis ---- **9**, 10
nemorosus ---- **5**, 6, 12
pallens ---- **1**, **5**, **6**, 7, **8**, 12
panicoides ---- 1
petiolatus ---- 9
tenuis ---- **3**, 4
wrightii ---- 3
Jubaria (section of Panicum) ---- 34

	Page.
Lasiacis	1, 18
anomala	29, 30, 31
compacta	28
divaricata	17, 20, 21, 23
globosa	23
grisebachii	16, 17
harrisii	20
leptostachya	19, 20
liebmanniana	28
ligulata	18, 19, 25, 31
oaxacensis	17, 18
patentiflora	24, 25
procerrima	13, 14, 15, 16
rhizophora	19
rugelii	16
ruscifolia	28, 29, 30
sloanei	23, 24, 25
sorghoidea	25, 28, 31
swartziana	26
Miliaria (section of Panicum)	34
Milium *nemorosum*	5
Nastus	49
Navicularia	1
hirta	1, 2
glabra	1, 10
lanata	1, 10
Nazia	49
racemosa	48, 77
Oplismenus	34
setarius	4
tenuis	3
Orthopogon (section of Panicum)	34
Panicastrella	49
Panicum	1, 13, 33, 34, 45
agglutinans	31
alsinoides	4
ambiguum	35
axillare	7
bambusioides	20
brizoides	34
caucasicum	36
cenchroides	52
chapmani	50
chauvinii	20
ciliatissimum	38
compactum	13, 28
cordovense	12
distachyon	35
distans	42
divaricatum	13, 20, 21, 23, 28
var. *puberulum*	18
var. *stenostachyum*	21
erucaeforme	34, 36, 37
exile	3
falciferum	34
fasciculatum	34
fruticosum	18, 25
gilesii	35
glaberrimum	10
glumare	34
glutinosum	25, 131
granulare	34
grisebachii	16
helopus	34, 35
hemignostum	6
hemitomon	43
ichnodes	11
Panicum intercedens	35
isachne	34, 36
var. *mexicana*	36
koenigii	36
lanatum	13, 25, 26
var. *sorghoideum*	26, 28
latifolium	18, 23
leandri	41
leiocarpon	10
liebmannianum	28
lindeni	8
loliaceum	2
maculatum	31
martianum	9
martinicense	13, 16, 26
mayarense	3
megacarpum	28
milliforme	35
nemorale	9
oaxacense	17
obtusum	43
orinocense	25
pallens	6
petiolatum	9
plantagineum	34, 41, 42
platyphyllum	40
polyphyllum	34, 35
praegnans	18, 25
procerrimum	15
pubinode	36
punctatum	34
reptans	43
reversum	35
rhizophorum	19
rugelii	16
ruscifolium	28
schlechtendahlii	12
var. *monstrosum*	12
sloanei	18, 23
sorghoideum	25, 26
swartzianum	26
tenue	3
villosum	35
wightianum	36
wightii	36
Paratheria	50
Paspalum	33
decumbens	34
platyphyllum	40
Paurochaetium (subgenus of Panicum)	50
Pennisetum	34, 50, 76
glaucum	77
mutilatum	77
myosuroides	52
nervosum	77
pungens	52
setosum	77
tristachyum	77
villosum	77
Raram	49
Rytilix granularis	77
Salicornia	49
Syntherisma	1, 34
Thrasya	34
Urochloa panicoides	34
Valota	34

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A STUDY OF ALLOCARYA

By CHARLES V. PIPER

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PREFACE.

The accompanying number of the Contributions, by Professor Charles V. Piper, of the Bureau of Plant Industry, United States Department of Agriculture, presents the results of a critical study of Allocarya, a genus of boraginaceous plants, natives chiefly of the western United States. From this territory 35 species have hitherto been described, two-thirds of these having been proposed by the late Edward L. Greene, who himself established the genus. The number is increased in the present paper to 79. The classification adopted is founded chiefly upon the diversity of sculpture and armature of the mature nutlets, these characters, though almost microscopic, being regarded as constant and diagnostic for the species, which in several of the groups are not distinguishable by evident superficial characters.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

CONTENTS.

	Page.
Introduction	79
Systematic treatment	81
Index	VII

A STUDY OF ALLOCARYA.

By Charles V. Piper.

INTRODUCTION.

The genus *Allocarya* of the family Boraginaceae was established by Dr. E. L. Greene in 1887[1] to embrace 18 species, nine of them newly proposed, most of the remainder having been included by Dr. Gray as a section (*Myosotidea*) first of *Eritrichium*[2] and later of *Krynitzkia*[3]. One species, *A. greenei*, was referred by Dr. Gray to a special section (*Echinoglochin*) under *Echinospermum*. The genus as delimited by Greene has been generally accepted as valid. It is best distinguished from allied genera by the ventrally keeled nutlets, which are attached basally or suprabasally to a low gynobase, and by having the lowermost leaves opposite. Dr. Greene indicated no type for the genus, but the first species in his treatment is *A. lithocarya* Greene.

Subsequent to the establishment of the genus 17 additional species have been proposed, 12 by Greene and one each by Howell, Jepson, Nelson, Brandegee, and Piper. There have thus been described from North America 35 species, mostly from the Rocky Mountains and westward, but two occur eastward from the one hundredth meridian, one, apparently the same as *A. scopulorum* Greene at Devils Lake, North Dakota, and the other, *A. lonchocarpa*, in Aurora County, South Dakota. At least three of the North American species, besides one other, *A. mexicana* Macbride, very like the South American *A. linifolia* (Lehm.) Macbride, occur in Mexico. From Chile about ten species have been described, and from Australia one is recorded.

The species of *Allocarya* grow mostly in soil that is wet and muddy during the winter or spring, such as stream banks, lake shores, the bottoms of temporary pools, etc. Some species grow in strongly alkaline soil. Not uncommonly two or more species occur growing together, and as they are superficially very similar collectors have often confused two or more under a single collection number. Nothing is known of the fertilization of these plants, but Greene[4] writes, "My long continued field observations lead me to suspect them of

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[1] Pittonia **1:** 14. 1887.
[2] Proc. Amer. Acad. **10:** 55. 1874.
[3] Proc. Amer. Acad. **20:** 265. 1885.
[4] Pittonia **1:** 11. 1887.

hybridizing freely in some localities, or, as most botanical writers would say, they are confluent or hard to define." The present studies have revealed no evidence of free intercrossing. The nutlet characters seem remarkably constant, and in mixed gatherings serve perfectly to segregate the species. Relying on the constancy of the nutlet characters in particular, it is necessary to recognize additional species.

A few species are widespread and abundantly represented in herbarium material, but many others are either very rare or very local, being known in a number of cases by only a single collection. It is apparent that much additional field work is necessary before the genus can be monographed satisfactorily.

The distinguishing characters of the species are not easily described, especially the various types of rugosity of the nutlets. When the nutlets are armed with slender bristles great care must be exercised in their examination, as the bristles are easily broken. The actual characters of such bristles can be seen only by use of a compound or a binocular microscope. The somewhat succulent species are as a rule readily distinguishable from those not at all succulent, albeit nearly all are very slender plants. There is rarely doubt in one's mind as to when the calyx is markedly accrescent, and in all known species this character is correlated with a somewhat succulent texture of the plant. In several of the groups the species are not distinguishable by any evident superficial characters. It is with reluctance that so many new species are recognized and proposed, but it seems the only logical treatment that will accord with the facts.

The annual species form a remarkably complete series of forms, the groups merging almost insensibly into one another. It is difficult to decide which characters are most important in tracing the phylogeny, but the structure of attachment of the nutlets appears of more profound significance than the form of the nutlet, the armature of its surface, or indeed any of the other characters. The groups with small ovoid nutlets and suprabasal scar are seemingly the most primitive, and it is not difficult to construct a diagram of the probable phylogeny. The evolution of the numerous forms is evidently very recent, and it is not improbable that the genus is in an active mutative state. The perennial *Molles* are not closely related to the annuals.

In the descriptions terms are used with the following significations: *rugulose*, for more or less continuous ridges which may be either even or dentate; *tuberculate*, for rounded prominences as high or nearly as high as the ridges; *papillate*, for projections like tubercles but taller and more slender; *granulate*, for the very fine, usually roundish elevations in the interspaces between the ridges. The epidermis of the nutlets may be perfectly smooth, or the epidermal cells may project

as conical, usually sharp muriculations (*muriculate*), conditions to be seen only with the microscope. *Glochidia* are trichomes with divergent cells or branches, usually only at the apex; when very small they can be seen clearly only with the microscope.

SYSTEMATIC TREATMENT.

In the study of the genus the writer has had access to the materia in the U. S. National Herbarium (N); the Gray Herbarium (G); the Greene Herbarium (E); the herbarium of the California Academy of Sciences (C); the herbarium of the University of California (B); and the herbarium of Stanford University (S).

On account of the great confusion that has existed in the genus, a rather extensive list of specimens is cited. It should be borne in mind, however, that many collections are mixtures. Not infrequently the sheet of a particular number in one herbarium is entirely different from that in others.

KEYS TO THE GROUPS AND SPECIES.

Plants perennial; pubescence soft and dense.....**I. Molles.**
Plants annual; pubescence stiff, strigillose, setulose, or hirsute.
Scar deeply excavate, half as long as the nutlet. (*A. scripta*, of the group *Humistratae*, may be sought here as the scar is large and excavate but only one-third as long as the nutlet.)
Nutlets armed with stout opaque bristles, these barbed their entire length, or the bristles obsolete on some nutlets in one species.....**II. Echinaceae.**
Nutlets unarmed, or the projections not barbed.....**III. Glyptocarpae.**
Scar not deeply excavate, sometimes large when basal.
Attachment and scar exactly basal; nutlets lanceoloid.
Nutlets armed with fine bristles.....**IV. Asperulae.**
Nutlets unarmed.....**V. Stipitatae.**
Attachment and scar not exactly basal, either oblique or clearly suprabasal.
Nutlets lanceoloid.....**VI. Lonchocarpae.**
Nutlets ovoid.
Nutlets armed with hyaline bristles or at least with short glochidia.
Calyx conspicuously accrescent.....**VII. Humistratae.**
Calyx not conspicuously accrescent.....**VIII. Penicillatae.**
Nutlets unarmed.
Bracts none.....**IX. Scoulerianae.**
Bracts present.
Ventral side of nutlets with a median sunken groove.....**X. Sulcatae.**
Ventral side of nutlets not with a median groove.
Corolla large, 4 to 5 mm. broad; pubescence spreading.
XI. Cooperianae.
Corolla small, 1 to 3 mm. broad; pubescence strigillose (except in *A. salsa* and *A. jucunda*).
Nutlets glossy, the epidermal cells not muriculate..**XII. Nitentes.**
Nutlets mostly dull, the epidermal cells muriculate.
XIII. Californicae.

I. MOLLES. Perennials, sometimes rooting at the nodes in one or perhaps both species; pubescence dense, close, and soft; racemes bracteate; calyx but little accrescent; corolla large; nutlets broadly ovoid, unarmed, the epidermal cells smooth or minutely muriculate; scar suprabasal.

Nutlets shiny, the dorsal rugae thick and obtuse, the small interspaces scarcely or not at all granulate.....**1. A. mollis.**
Nutlets dull, the dorsal rugae fine, the large interspaces conspicuously granulate.....**2. A. vestita.**

II. ECHINACEAE. Annuals; pubescence mostly strigillose and sparse; racemes bracteate; calyx somewhat spreading and moderately accrescent; corolla small; nutlets broadly ovoid, armed with stout opaque bristles, these divaricately barbed their entire length; scar deeply excavate, half as long as the nutlet.

Length of bristles about one-sixth the width of the nutlet.....**3. A. hystricula.**
Length of bristles one-fourth or more of the width of the nutlet.
Dorsal surface of nutlet more or less rugulose-reticulate.
Reticulations few, large, irregular. Bristles mostly on the dorsal ridge and margins.....**4. A. acanthocarpa.**
Reticulations small and regular, each including 1 to 4 tubercles.
Bristles of the nutlet few, on some nutlets entirely lacking.
5. A. oligochaeta.
Bristles of the nutlet numerous.....**6. A. echinacea.**
Dorsal surface of the nutlet not at all rugulose.
Bristles only on the dorsal ridge and on the marginal angles of the nutlets.
Surface of nutlet coarsely granulate.....**7. A. austinae.**
Surface of nutlet smooth.....**8. A. cristata.**
Bristles covering the whole back of the nutlet.
Nutlets rugulose on the ventral surface.....**9. A. eastwoodae.**
Nutlets not rugulose on the ventral surface.....**10. A. greenei.**

III. GLYPTOCARPAE. Annuals; pubescence mostly strigillose and sparse; racemes bracteate; calyx somewhat spreading, moderately if at all accrescent; corolla various; nutlets broadly ovoid, unarmed, variously sculptured; scar deeply excavate, usually half as long as the nutlet.

Corolla 4 to 6 mm. broad. Calyx somewhat spreading, moderately accrescent; nutlet 2 mm. long, the back with very sharp prominent dentate ridges.
11. A. glyptocarpa.
Corolla very small.
Nutlets 2 mm. long, the back armed with about 20 slender erect smooth projections.....**12. A. spiculifera.**
Nutlets 1.5 mm. long, the back not armed as above.
Calyx strongly accrescent; dorsal ridges of the nutlets sharp and prominent, somewhat dentate.....**13. A. anaglyptica.**
Calyx scarcely accrescent; dorsal ridges of the nutlets low and obtuse.
Nutlets with many prominent papillae besides the finer granulations.
14. A. papillata.
Nutlets with few obscure granulations in the interspaces, not at all papillate.
Flowers widely distant; scar only one-third as long as nutlet; rugae coarse and transverse.....**15. A. distantiflora.**
Flowers not widely distant; scar half as long as nutlet; rugae not as above.
16. A. microcarpa.

IV. ASPERULAE. Annuals; pubescence strigillose; racemes bracteate; calyx various; corolla small; nutlets lanceoloid, armed with slender hyaline bristles, these mostly barbed or branched at tip; scar basal.

Plants conspicuously strigillose, slender-stemmed; calyx not conspicuously accrescent. Racemes rather dense.
Inflorescence with many bracts; bristles of nutlet mostly in tufts. **17. A. nelsoni.**
Inflorescence with few bracts; bristles mostly solitary..... **18. A. oricola.**
Plants sparsely strigillose, rather fleshy; calyx conspicuously accrescent, thickened at base and holding the nutlets firmly.
Nutlets 4 times as long as broad; bristles mostly unbarbed on both surfaces of nutlet. **19. A. leptoclada.**
Nutlets 2 to 3 times as long as broad; bristles barbed at tip.
Fruiting calyx 3 to 5 mm. long. Nutlets conspicuously bristly only on the back, the venter rugulose, granulate, and minutely bristly ..... **20. A. divergens.**
Fruiting calyx 6 to 10 mm. long.
Nutlets bristly on both surfaces, rugulose beneath..... **21. A. asperula.**
Nutlets bristly only on dorsal surface, merely granulate beneath. **22. A. wilcoxii.**

V. STIPITATAE. Annuals, rather succulent; pubescence strigillose or setulose; racemes bracteate (except in *A. leibergii*); calyx accrescent, thickened at base, holding the nutlets firmly; corolla various; nutlets lanceoloid, unarmed, variously sculptured; scar basal.

Pubescence of the leaves loose and spreading, that of the stem somewhat appressed; nutlets 2 mm. long. Scar large..... **23. A. setulosa.**
Pubescence all strigillose; nutlets 1.5 mm. long.
Corolla large, 5 to 7 mm. broad..... **24. A. stipitata.**
Corolla small, 2 to 4 mm. broad.
Plant very stout and fleshy..... **25. A. glabra.**
Plant not very fleshy.
Bracts none. Nutlets rugulose and granulate above, merely rugulose beneath. **26. A. leibergii.**
Bracts present.
Nutlets tuberculate above, rugulose beneath..... **27. A. tuberculata.**
Nutlets rugulose above.
Scar very small. Nutlets merely rugulose beneath... **28. A. orthocarpa.**
Scar large.
Nutlets rugulose and coarsely granulate beneath. **24a. A. stipitata micrantha.**
Nutlets sparsely and faintly granulate beneath, not at all rugulose. **29. A. charaxata.**

VI. LONCHOCARPAE. Annuals, inclined to be succulent; pubescence strigillose; racemes bracteate; calyx more or less accrescent; corolla small; nutlets lanceoloid, unarmed, variously sculptured; scar nearly basal but oblique.

Calyx slightly accrescent; flowers mostly bractless; nutlets faintly if at all rugulose beneath..... **30. A. ambigens.**
Calyx decidedly accrescent; flowers mostly bracteate; nutlets reticulate-rugulose beneath..... **31. A. lonchocarpæ.**

VII. HUMISTRATAE. Annuals; pubescence strigillose, sparse; racemes bracteate; calyx conspicuously accrescent; corolla small; nutlets ovoid, armed with slender, hyaline, mostly tufted bristles, these barbed at the tip; scar suprabasal.

Interspaces of nutlet deep, smooth..... **32. A. scripta.**

Interspaces of nutlet not deep, granulate.
Nutlets not bearing hyaline bristles but densely covered with microscopic, nearly sessile glochidia.....**33. A. limicola.**
Nutlets covered with evident hyaline bristles, these mostly in tufts.
Bristle tufts few, mostly on the margins and dorsal keel; rugosities low, rather even.....**34. A. sigillata.**
Bristle tufts numerous on all the dorsal rugosities, the latter irregularly dentate. **35. A. humistrata.**

VIII. PENICILLATAE. Annuals, slender; pubescence strigillose; racemes bracteate; calyx not accrescent; corolla various, mostly small; nutlets ovoid, armed with hyaline bristles or nearly sessile glochidia; scar suprabasal, small.

Bristles short, not at all barbed or branched.....**36. A. cryocarpa.**
Bristles all or mostly barbed or branched at tip.
Corolla large, 4 to 5 mm. broad; racemes mostly bractless, rarely with one or two bracts.
Bristles of the nutlet very short, almost sessile; scar linear.....**37. A. gracilis.**
Bristles of the nutlet not very short; scar not linear.
Scar ovate; dorsum with about 20 papillae; bristles armed at tip..**38. A. laxa.**
Scar lanceolate; dorsum dentate-rugulose; bristles, except those on the ridges, unarmed.....**39. A. pratensis.**
Corolla small, 1 to 2 mm. broad; racemes with at least a few bracts.
Glochidia very short, sessile, the stalk scarcely evident.
Nutlets 1.5 mm. long, not conspicuously granulate; scar ovate. **40. A. hispidula.**
Nutlets 1.2 mm. long, conspicuously granulate; scar linear to lanceolate. **41. A. tenera.**
Glochidia longer, the hyaline stalk clearly evident.
Bristles merely barbed at tip, the most conspicuous ones in clusters on the prominent tubercles. Scar linear to lanceolate.....**42. A. penicillata.**
Bristles slender, all or most of them branched at tip like a deer horn.
Scar ovate-triangular, almost basal; inflorescence dense....**43. A. cervina.**
Scar narrowly pyriform, clearly suprabasal; inflorescence loose. **44. A. ramosa.**

IX. SCOULERIANAE. Annuals, slender, mostly erect; pubescence strigillose or hirsute; racemes entirely bractless; corolla large; nutlets ovoid, unarmed, sculptured; scar suprabasal.

Pubescence spreading, at least on the calyx.
Racemes dense, the internodes about as long as the calyx; stems setose; epidermal cells of nutlet sharply muriculate, unicellular.....**45. A. hirta.**
Racemes loose, the internodes 2 to 4 times as long as the calyx; stems strigillose; epidermal cells of nutlets produced into short trichomes bearing minute apical cells.....**46. A. calycosa.**
Pubescence all appressed. Epidermal cells of nutlets all or some of them produced into short trichomes with minute apical cells.
Calyx spreading; epidermal muriculations of nutlet all multicellular. **47. A. figurata.**
Calyx erect; epidermal muriculations of nutlet partly unicellular and partly multicellular.
Flowers 5 mm. broad; calyx scarcely ferruginous; scar and base of keel in a depression surrounded by a conspicuous ridge..... ....**48. A. vallata.**
Flowers 8 mm. broad; calyx ferruginous; scar and base of keel not in a depression. **49. A. scouleri.**

X. SULCATAE. Annuals, slender; pubescence strigillose; racemes bracteate; calyx little or not at all accrescent; corolla small; nutlets ovoid, smooth or sculptured but not bristly, the keel or scar or both in a sunken median groove formed by the overarching sides of the nutlet, the keel sometimes completely concealed; scar suprabasal.

Groove completely closed, at most the edge of the keel exposed.
Nutlets smooth and shiny.....**50. A. lithocarya.**
Nutlets rugulose or granulate or both, dull.
Pedicels as long as the calyx or longer; corolla 5 to 6 mm. broad.
51. A. chorisiana.
Pedicels nearly all shorter than the calyx; corolla 2 to 3 mm. broad.
52. A. hickmanii
Groove open, very narrow to very broad, or incomplete, that is, evident only near the base.
Scar linear.
Corolla 5 to 6 mm. broad; pedicels mostly as long as the calyx, or longer.
51. A. chorisiana.
Corolla 1 to 3 mm. broad; pedicels all or mostly shorter than the calyx.
Groove narrow, deep, extending the whole length of the nutlet; nutlets sparsely rugulose but conspicuously granulate.....**53. A. myriantha.**
Groove very shallow, only the scar and base of keel sunken; nutlets closely rugulose with low obtuse ridges, not granulate.....**54. A. undulata.**
Scar ovate.
Corolla 3 mm. broad; pedicels all shorter than the calyx.
Nutlets minute, 0.6 to 0.7 mm. long.....**55. A. minuta.**
Nutlets larger.
Calyx lobes erect, barely exceeding the nutlets; nutlets 1.5 to 2 mm. long, rugulose and granulate.....**56. A. stricta.**
Calyx lobes spreading, twice as long as the nutlets; nutlets 1.5 mm. long, rugulose, not granulate.....**57. A. scalpta.**
Corolla 1 to 2 mm. broad; pedicels mostly short, a few of the lower ones elongate.
Nutlets shiny, the interspaces of the reticulations smooth..**58. A. reticulata.**
Nutlets dull, the interspaces conspicuously granulate.
Calyx setulose; racemes with few bracts.....**59. A. areolata.**
Calyx strigillose; racemes with many bracts, these mostly between the flowers.....**60. A. diffusa.**

XI. COOPERIANAE. Annuals; pubescence sparse, spreading; racemes bracteate; calyx not accrescent; corolla large, rotate; nutlets ovoid, shiny, sculptured but not bristly, the epidermal cells smooth; scar small, suprabasal.

One species.....**61. A. cooperi.**

XII. NITENTES. Annuals, slender; pubescence strigillose or setulose; racemes bracteate; calyx not accrescent; corolla small; nutlets ovoid, smooth or sculptured, not bristly, mostly glossy, the epidermis of the nutlets smooth or at most only a few of the epidermal cells muriculate; scar suprabasal, linear to ovate.

Nutlets not at all rugulose or granulate.....**62. A. nitens.**
Nutlets rugulose or granulate or both.
Pubescence all spreading.
Flowers densely crowded; dorsum coarsely granulate, obscurely rugulose; scar rather large.....**63. A. salsa.**
Flowers not densely crowded; dorsum coarsely granulate below and conspicuously rugulose above the middle; scar very small.....**64. A. jucunda**

Pubescence all strigillose.
Scar linear to lanceolate.
Nutlets very glossy, 1.5 mm. long, the dorsal rugae low; scar linear to lanceolate.....**65. A. cusickii.**
Nutlets not very glossy, 1.2 mm. long, the dorsal rugae prominent; scar linear.....**66. A. inornata.**
Scar ovate.
Nutlets rugulose and tuberculate but not granulate; corolla 3 mm. broad.
67. A. media.
Nutlets rugulose and granulate; corolla 1 to 2 mm. broad.
Stems stout and stiffly spreading; nutlets moderately rugulose.
68. A. divaricata.
Stems not stout or stiffly divaricate; nutlets strongly rugulose.
69. A. cognata.

XIII. CALIFORNICAE. Annuals, mostly very slender; pubescencestrig illose; racemes bracteate; calyx not accrescent (except in *A. plebeja*, *A. trachycarpa*, and *A. diffusa*); corolla small; nutlets ovoid, sculptured, not bristly, dull (except in *A. dispar* and *A. insculpta*), the epidermal cells of the nutlet all or mostly muriculate, none or at most a very few forming imperfect glochidia; scar suprabasal or in a few species nearly basal.

Scar ovate, somewhat excavate, one-fourth as long as the nutlet, the margins flangelike.
Ridges of the nutlet sharp and dentate.....**70. A. trachycarpa.**
Ridges of the nutlet not sharp or dentate.....**71. A. interrasilis.**
Scar neither excavate nor with flangelike margins.
Interspaces between the ridges of the nutlet smooth or at most very obscurely granulate.
Calyx decidedly accrescent; nutlets dull.....**72. A. plebeja.**
Calyx not accrescent; nutlets somewhat glossy.
Nutlets constricted toward the tip, the dorsal ridges coarse and the interspaces small, rugulose beneath.....**73. A. insculpta.**
Nutlets not constricted toward the tip, the dorsal ridges fine and the interspaces large, not rugulose beneath.....**74. A. dispar.**
Interspaces granulate; calyx slightly if at all accrescent.
Scar almost basal, small, ovate.
Surface of the nutlets predominantly granulate, the ridges low and thin.
75. A. granulata.
Surface of the nutlets predominantly rugulose, the interspaces granulate.
76. A. conjuncta.
Scar clearly suprabasal.
Herbage almost glabrous; scar linear, minute.....**77. A. corrugata.**
Herbage decidedly strigillose; scar lanceolate or narrowly panduriform to ovate.
Corolla 3 mm. broad; nutlets tuberculate-rugulose.....**78. A. scalpocarpa.**
Corolla 1 to 2 mm. broad; nutlets rugulose, not at all tuberculate.
79. A. californica.

1. Allocarya mollis (A. Gray) Greene, Pittonia **1:** 20. 1887.
Krynitzkia mollis A. Gray, Proc. Amer. Acad. **19:** 89. 1883.
TYPE LOCALITY: "Sierra Valley, California, on alkaline wet flats and borders of ponds, *Lemmon*, 1874 to 1883."

SPECIMENS EXAMINED:

CALIFORNIA: Sierra Valley, *Lemmon*, July, 1885 (N, E, C); *Lemmon*, in 1875 (N); *Lemmon* 53, in 1879 (G); *Lemmon* 498, in 1874 (G); *Lemmon*, in 1883 (G); *Leiberg* 5206, July 24, 1900 (N). Pitt River, *Austin* 1447 (N, G, E). Egg Lake, Modoc County, *M. S. Baker*, June 25, 1893 (E, B). Loyalton, *Eastwood* 7847, June 29, 1915 (C). Portola, *K. Brandegee*, July 30, 1911 (B.)

NEVADA: "Northwestern Nevada," *Lemmon* in 1875 (G).

OREGON: Near "P" Ranch, *Cusick* 2599, June 24, 1901 (N, E). Harney Valley, *Cusick* 2045, July 18, 1898 (N, E, G). Swan Lake Valley, *Applegate* 371, July 14, 1895 (N, G). Sprague River Valley near Yainax Bridge, *Coville & Leiberg* 320, August 10, 1896 (N). Keno, Klamath Valley, *Cusick* 2843, June 20, 1902 (N, G). Malheur Lake bottoms, *Griffiths & Morris* 733, August 1901 (N).

2. Allocarya vestita Greene, Erythea **3**: 125. 1895.

Allocarya mollis vestita Jepson, Fl. West. Mid. Calif. 442. 1901.

TYPE LOCALITY: Petaluma, California. Type collected by J. W. Congdon in 1880.

SPECIMENS EXAMINED:

CALIFORNIA: Petaluma, *Congdon*, July 2, 1880 (E, G, B). Visalia, *Congdon*, September, 1882 (G).

3. Allocarya hystricula Piper, sp. nov.

Annual; branches slender, decumbent, 30 to 45 cm. long, sparsely strigillose; leaves linear to linear-oblanceolate, acute, 1 to 2 cm. long, densely strigillose beneath, sparsely so above; flowers scattered, short-pediceled, many of the lower ones with bracts; calyx densely covered with somewhat appressed bristles, markedly accrescent, the lanceolate acute lobes becoming 5 to 6 mm. long, one-sixth to one-fourth as long as the internodes; corolla very small, not exceeding the calyx, less than 2 mm. broad; nutlets broadly ovoid, 2 mm. long, the dorsum obscurely ridged in the median line, densely covered with very short stout bristles, these armed their whole length with divaricate barbs and joined at their bases by mostly oblique ridges, the interspaces granulate, the venter keeled and obliquely rugulose but not bristly; scar large, ovate, sunken, half as long as the nutlet.

Type in the U. S. National Herbarium, no. 42063, collected on Montezuma Hills, Solano County, California, May 14, 1892, by W. L. Jepson.

ADDITIONAL SPECIMEN EXAMINED:

CALIFORNIA: Elmira, *K. Brandegee*, May, 1883 (B).

Closely allied to *A. greenei* (A. Gray) Greene, but well distinguished by the very short, stout bristles of the nutlet, which are about one-sixth as long as the breadth of the nutlet.

4. Allocarya acanthocarpa Piper, sp. nov.

Annual, branched from the base, 10 to 15 cm. high; branches slender, simple, finely and sparsely strigillose; leaves narrowly oblanceolate, acutish, nearly glabrous above, strigillose beneath, 1 to 1.5 cm. long; racemes loose, the internodes 4 to 6 times as long as the calyces, many of the flowers leafy-bracteate; pedicels much shorter than the calyces; calyx spreading, the lance-linear lobes obtuse, 2.5 mm. long, densely strigillose, somewhat ferruginous at tip; corolla small, 1.5 mm. broad; nutlets pale, very angularly ovoid, as thick as broad, sharply acute, about 2 mm. long, the dorsal keel, margins, and dorsal ridges prominent and armed with stout opaque bristles, these retrorsely barbed on the upper half or for the whole length; dorsum with a keel two-thirds of the length, armed with 5 or 6 bristles, the prominent, almost continuous lateral margins with 3 or 4 bristles on each side, usually with 1 or 2 bristles on the most prominent intermediate dorsal ridge on each side, the interspaces

coarsely granular or tuberculate; venter coarsely reticulate-rugulose, not granulate, keeled from scar to apex; scar ovate, deeply excavate, half as long as the nutlet.

Type in the University of California Herbarium, no. 78207, collected at Caliente, California, by T. S. Brandegee.

5. Allocarya oligochaeta Piper, sp. nov.

Annual, branched from the base, the branches erect or ascending, 10 cm. long; stems slender, densely and loosely strigillose; leaves linear-oblanceolate, acutish, 1 to 2 cm. long, sparsely strigillose above, densely so beneath with rather long hairs; racemes loose, the internodes about 4 times as long as the fruiting calyces, the lower flowers leafy-bracted; pedicels shorter than the calyces; calyx lobes erect, lanceolate, densely strigillose on both sides, ferruginous when young, slightly accrescent, at length about twice as long as the nutlets; corolla small, about 2 mm. broad, barely exceeding the calyx; nutlets ovoid, 2 mm. long, sharply acute, the whole surface deeply reticulate with sharp ridges, these forming polygonal areoles each containing 1 to several tubercles, the dorsum sometimes bearing a few short bristles barbed for their whole length; venter keeled from the scar to the apex; scar ovate, somewhat excavate, half as long as the nutlet.

Type in the Gray Herbarium, collected in the San Joaquin Valley, California, April 23, 1884, by E. L. Greene.

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: Byron Springs, *Eastwood* 3808 (in part), March 14, 1892 (G, C). Antioch, *Davy* 913, April 7, 1895 (B).

Closely allied to *A. echinacea* Piper, the sculpturing of the nutlet being very similar, but the bristles are very few, short, and irregular, or on some nutlets wanting. The pubescence of the plant also is much denser and longer.

6. Allocarya echinacea Piper, sp. nov.

Annual, erect or ascending, mostly few-branched from the base, 10 to 30 cm. high stems sparsely strigillose; leaves linear or linear-oblanceolate, mostly acute, glabrous or nearly so above, strigillose and somewhat pustulate beneath, 1 to 4 cm. long; racemes loose, some of the flowers leafy-bracted; pedicels mostly shorter than the calyx lobes; calyx lobes erect, lanceolate, acutish, densely strigillose beneath, slightly ferruginous when young, 5 to 6 mm. long; corolla barely exceeding the calyx, 2 to 3 mm. wide; nutlets 3.5 mm. long, ovoid, somewhat compressed above the middle, the dorsum densely granulate, prominently keeled, armed with numerous stout bristles about half as long as the width of the nutlet, these divaricately barbed their whole length and with their bases connected by ridges, the numerous areoles thus formed each containing 1 to 6 prominent tubercles; venter granulate and prominently keeled; scar deep, triangular, broadly flange-margined, lateral, over one-third as long as the nutlet.

Type in the U. S. National Herbarium, no. 440508, collected at University Heights, San Diego, California, April 12, 1902, by T. S. Brandegee (C. F. Baker, no. 825).

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: Duplicates of type (B, E, G). San Diego, *Brandegee*, in 1898 (N); *Parry & Jones*, March, 1882, in part (G); *Mary F. Spencer*, March 24, 1916 (B); *Brandegee*, April 22, 1894 (B). Alcalde, *Brandegee*, March 29, 1893 (B). San Marcos, *Cleveland*, April 21, 1882 (N). Livermore Valley, *Greene*, April 3, 1895 (N, E). Byron, *Greene*, March 24, 1889 (N, E). Byron Springs, *Eastwood* 3832 (N, G). Elmira, *Greene*, May 3, 1886 (G). Mariposa, *Congdon*, April 15, 1895, in part (S). Lewis, Mariposa County, *Congdon*, April 17, 1892 (B).

LOWER CALIFORNIA: Tijuana Valley, *Orcutt* 2261, March 31, 1886 (N).

Near *A. greenei* (A. Gray) Greene, but in that the bases of the bristles are entirely separate.

7. Allocarya austinae Greene, Pittonia 1: 18. 1887.

TYPE LOCALITY: Butte County, California. Type collected by Mrs. R. M. Austin in 1883.

SPECIMENS EXAMINED:

CALIFORNIA: Butte County, *Austin*, in 1883 (B, G, C), in 1896 (B). Shasta, *Parry*, in 1887 (N). Adobe flats, Little Chico, *Austin* (N). Adobe land east of Chico, *Austin*, April, 1896 (E). Plains east of Chico, *Austin* 627, May, 1896; mixed with *A. stipitata* (N). Chico, *Parry*, April 14, 1887 (E). Stoney Creek, Amador County, *Hansen* 1610 (N). Marysville Buttes, *Heller* 11272 (E). Millville Road near Redding, *M. S. Baker*, in 1896 (E).

8. Allocarya cristata Piper, sp. nov.

Annual, erect or ascending, simple or branched from the base, 5 to 8 cm. high; stems very sparsely strigillose; leaves linear, acute, 0.5 to 2 cm. long, glabrous above, sparsely strigillose beneath, pustulate-strigillose on the margins; racemes few-flowered, bracteate, densly ferruginous-strigillose; pedicels shorter than the calyces; calyx lobes erect, lanceolate, acutish, about 4 mm. long, little exceeding the nutlets; corolla not seen; nutlets 3 mm. long, angularly ovoid, strongly compressed above the middle, the dorsum nearly smooth, somewhat shiny, keeled with a high narrow ridge bearing 4 to 6 stout bristles, these divaricately barbed their whole length, 1 or 2 similar bristles on each margin near the middle, sometimes a single similar bristle on each margin near the apex, the venter coarsely rugulose, prominently keeled; scar lateral, triangular, deep, nearly half as long as the nutlet.

Type in the herbarium of the California Academy of Sciences, collected at Mokelumne Hill, Calaveras County, California, by F. E. Blaisdell.

A remarkable species, allied to *A. austinae* Greene.

9. Allocarya eastwoodae Piper, sp. nov.

Annual, erect, simple or sparingly branched from near the base, 10 to 15 cm. high; stems very sparsely strigillose; leaves linear-oblanceolate, acute, glabrous above, strigillose beneath, 1 to 2 cm. long; racemes loosely few-flowered, bracteate below; pedicels shorter than the calyces; calyx lobes lanceolate, strigillose, spreading in fruit, scarcely accrescent, at length 2 mm. long, one-sixth to one-fourth as long as the internodes; corolla minute, not longer than the calyx, 1 mm. broad; nutlets broadly ovoid, 1.5 mm. long, the dorsum convex, strongly keeled, sparsely granulate and bearing about 30 slender separate bristles, these divaricately barbed their entire length, the venter conspicuously rugulose but not bristly, keeled from the scar to the tip; scar broadly ovate, deep, flange-margined, one-half as long as the nutlet.

Type in the U. S. National Herbarium, no. 880534, collected at Guernsey, Tulare County, California, March 25, 1914, by Miss Alice Eastwood (no. 3896).

Very closely allied to *A. greenei*, but differing in having the smaller nutlets rugulose beneath. The type specimens are probably smaller than normal. Specimens of the same collection are in the herbarium of the California Academy of Sciences and in the Gray Herbarium.

10. Allocarya greenei (A. Gray) Greene, Bot. San Fran. Bay 259. 1894.

Echinospermum greenei A. Gray, Proc. Amer. Acad. **12**: 163. 1877.

Allocarya echinoglochin Greene, Pittonia **1**: 15. 1887.

TYPE LOCALITY: "About Yreka, Siskiyou Co., in the northern part of California. 1876, *E. L. Greene.*"

SPECIMENS EXAMINED:

CALIFORNIA: Yreka, *Greene*, May 2, 1872 (type); *Butler* 668, April 30, 1909 (B). Shasta, *Parry*, in 1887 (N). Amador County, *Hansen* (E). Stoney Creek, *Hansen* 1610 (N, S). Chico, (*Mrs. R. M. Austin*?) 627, May, 1896, mixed

with *A. stipitata* (N). Mokelumne Hill, Calaveras County, *Blaisdell* (C). Between Shingle Springs and El Dorado, *Heller* 12293, April 7, 1911 (G). San Diego, *O. W. Knight*, March, 1892 (G); *Jones*, March 15, 1882 (G). Eight miles south of Oroville, *Heller* 11266, April 6, 1914 (G, E, S). Marysville Buttes, *Heller* 11272, April 8, 1914 (G). Folsom, *K. Brandegee*, June, 1893 (B). Rose Springs, *M. H. Gates*, in 1879 (B). Ione, *Brandegee*, May, 1890 (B).

OREGON: Southern Oregon, *Howell* 220, in 1884 (G). Rogue River Valley, *Howell*, April 16, 1887 (E).

11. Allocarya glyptocarpa Piper, sp. nov.

Annual, erect, branched from the base, about 30 cm. high; stems slender, shiny, very sparsely strigillose; leaves linear to lance-linear, obtusish, glabrous above, sparsely strigillose beneath, 2 to 5 cm. long; racemes subsecund, very loose, the internodes 4 to 6 times as long as the fruiting calyces, some of the lower flowers leafy-bracted; calyx lobes somewhat spreading, lanceolate, strigillose on both sides, ferruginous when young, somewhat accrescent, at length twice as long as the nutlets; corolla about 4 mm. broad, well exceeding the calyx; nutlets pale, ovoid, 2 mm. long, the dorsum keeled toward the apex, sharply rugulose with about 7 exactly transverse, somewhat dentate ridges, obscurely granulate in the grooves, the venter merely rugulose, keeled from the scar to apex; scar ovate, deep, flange-margined, half as long as the nutlet.

Type in the Gray Herbarium, collected in moist cultivated ground, eight miles north of Oroville, California, March 16, 1914, by A. A. Heller (no. 11202). Also collected, without locality, by Mrs. R. M. Austin, in 1898 (B).

12. Allocarya spiculifera Piper, sp. nov.

Annual, branched from the base, the slender branches spreading or ascending, 10 to 20 cm. long; stems rather densely strigillose; leaves linear-oblanceolate, acutish, nearly glabrous above, pustulate-strigillose beneath, 1 to 3 cm. long; racemes loose, the lower flowers leaty-bracted, the internodes 2 to 5 times as long as the calyces; pedicels shorter than the calyces; calyx lobes erect, narrowly lanceolate, acute, densely strigillose on both sides, somewhat accrescent, at length twice as long as the nutlets; corolla very small, not exceeding the calyx; nutlets 2 mm. long, ovoid, pungently acute, the dorsum keeled its whole length, densely granulate, studded with stiff slender papillae, these more or less joined by connecting ridges, the venter merely rugulose, keeled from the scar to the apex; scar triangular-ovate, deeply excavate, flange-margined, half as long as the nutlet.

Type in the U. S. National Herbarium, no. 880547, collected between Earlimart and Delano, Tulare County, California, March 26, 1914, by Miss Alice Eastwood (no. 3939).

Specimens of the same collection are in the Gray Herbarium and in the herbarium of the California Academy of Sciences.

ADDITIONAL SPECIMEN EXAMINED:

CALIFORNIA: Goshen, "*B*" (=Brandegee?), May, 1891, in part (B).

13. Allocarya anaglyptica Piper, sp. nov.

Annual, branched from the base, the branches 10 to 20 cm. long; stems strigillose; leaves oblong-linear or somewhat oblanceolate, acutish, nearly glabrous above, densely strigillose beneath, 1 to 3 cm. long; racemes loose, the internodes in fruit 4 to 6 times as long as the calyces, the lower flowers leafy-bracted; calyx strongly accrescent, spreading, strigillose, the lance-linear lobes acute, at length 4 to 6 mm. long; corolla very small, barely exceeding the calyx; nutlets strongly ovoid, 1.5 mm. long, very acute, the dorsum convex, keeled its whole length, transversely rugulose with low

sharp dentate ridges, densely granulate in the interspaces, the venter strongly rugulose, keeled from the scar to the apex; scar ovate, deep, half as long as the nutlet.

Type in the herbarium of the California Academy of Sciences, collected between Earlimart and Delano, Tulare County, California, March 26, 1914, by Miss Alice Eastwood (no. 3939, in part).

14. Allocarya papillata Piper, sp. nov.

Annual, branched from the base, the branches spreading or ascending 15 to 25 cm. long; stems slender, sparsely strigillose; leaves linear, acutish, nearly glabrous above, strigillose and more or less pustulate beneath, 2 to 4 cm. long; racemes loose, the internodes in fruit 4 to 6 times as long as the calyces, some of the flowers leafy-bracted; pedicels shorter than the calyces; calyx but little accrescent, strigillose, the lance-linear lobes attenuate and acutish; corolla very small, barely extruding; nutlets broadly ovoid, sharply acute, the dorsum keeled its whole length, transversely rugulose with low broken ridges, strongly papillate (especially on the margins and keel), the interspaces granulate, the venter merely rugulose, prominently keeled from scar to apex; scar ovate, excavate, half as long as the nutlet.

Type in the herbarium of the California Academy of Sciences, collected at Delano, Tulare County, California, March 26, 1914, by Miss Alice Eastwood (no. 3965).

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: Roseville, *K. Brandegee*, May, 1884 (B). Goshen, "*B*," May, 1891, in part (B).

15. Allocarya distantiflora Piper, sp. nov.

Annual, not succulent, branched from the base; branches mostly simple, erect, 15 to 20 cm. high, loosely and sparsely strigillose; leaves linear-lanceolate, 1 to 2 cm. long, loosely strigillose or setulose on both sides; stems flowering almost from the base, the internodes 5 to 15 times as long as the calyces; bracts several; pedicels shorter than the calyces; calyx densely setulose, not accrescent, the lanceolate, acutish, somewhat spreading lobes about 3 mm. long; corolla small, barely exceeding the calyx, 1 to 2 mm. broad; nutlets ovoid, dull, much constricted above the middle, acute, sharply and dentately angular, 1.5 mm. long, the dorsum dentately keeled its entire length, coarsely and closely transverse-rugulose, the venter similarly rugulose, the edges somewhat inflexed over the scar, keeled from the scar to the apex; scar oval, excavate, one-third as long as the nutlet.

Type in the University of California Herbarium, no. 78229, collected at Madera, California, April, 1888, by P. S. Buckminster.

16. Allocarya microcarpa Piper, sp. nov.

Annual, much branched from the base, the branches procumbent to ascending, 6 to 12 cm. long; stems strigillose; leaves linear, acutish to obtuse, glabrous or nearly so above, sparsely strigillose beneath, 1 to 3 cm. long; racemes loose, the lower flowers leafy-bracteate; pedicels shorter than the calyces; calyx lobes narrowly lanceolate, acutish, hispidulous, not accrescent, at length 3 mm. long; corolla minute, barely exceeding the calyx; nutlets angularly ovoid, dull, 1.2 mm. long, nearly as thick as broad, the dorsum faintly keeled its entire length, rugulose with low, thick, rather even ridges, faintly granulate in the interspaces, the venter rugulose, keeled from scar to apex; scar ovate, excavate, half as long as the nutlet.

Type in the Gray Herbarium, collected at Mariposa, California, May 10, 1897, by J. W. Congdon (no. 48).

ADDITIONAL SPECIMEN EXAMINED:

CALIFORNIA: Mariposa, *Congdon*, April 15, 1895, mixed with *A. echinacea* (S).

In general appearance this species much resembles *A. californica* (Fisch. & Mey.) Greene, but the nutlets ally it with a very different group.

17. Allocarya nelsonii Greene, Erythea **3:** 48. 1895.

TYPE LOCALITY: Silver Creek, Wyoming. Type, in the Greene Herbarium, collected by A. Nelson (no. 1198), August 26, 1894.

SPECIMENS EXAMINED:

WYOMING: Silver Creek, *Nelson* 1198 (E, G, N). Duck Creek, Albany County, *Nelson* 7462 (G, N).

ROCKY MOUNTAINS: *E. Hall*, raised from seed (G); *Hall & Harbour* 433, in part (G).

18. Allocarya oricola Piper, sp. nov.

Annual, branched from the base, the ascending branches 10 to 25 cm. long, strigillose; leaves linear-oblanceolate, acutish, glabrous or nearly so above, strigillose beneath, 1 to 2 cm. long; racemes subsecund, a few of the flowers bracted; pedicels very short; calyx very sparsely setulose, markedly accrescent, becoming thickened at base, at length 5 to 7 mm. long, mostly one-third to one-half as long as the internodes; corolla minute; nutlets lanceoloid, 2 to 5 mm. long, the dorsum keeled only near the tip, tuberculate and obliquely rugose, bearing slender bristles, these barbed near the tip, the venter keeled its whole length, granulate and bristly; scar basal, roundish, flange-margined.

Type in the U. S. National Herbarium, no. 543877, collected at Shoshone, Lincoln County, Idaho, July 18, 1911, by A. Nelson and J. F. Macbride (no. 1170). Specimens of the same collection are in the Gray Herbarium and the herbaria of Stanford University and the University of California. No. 1167 of the same collectors, from the same locality, also is of this species.

Very near *A. leptoclada* Greene but the bristles of the nutlet are very different.

19. Allocarya leptoclada Greene, Pittonia **3:** 109. 1896.

TYPE LOCALITY: Pine Creek, Nevada. Type, in the Greene Herbarium, collected by E. L. Greene, July 20, 1896.

Known only from the original collection.

20. Allocarya divergens Piper, sp. nov.

Annual, somewhat succulent, divergently branched from the base, the branches stiff and straight, very sparsely strigillose, 10 to 20 cm. long; leaves narrowly linear, glabrous above, very sparsely setulose beneath, 2 to 4 cm. long; racemes very loose, subsecund, some of the flowers bracteate; pedicels very short; calyx very sparsely strigillose, accrescent, at length firm, the lobes becoming 3 to 5 mm. long, mostly about one-fourth as long as the internodes; corolla exceeding the calyx, 1 mm. broad; nutlets ovoid, 1.5 mm. long, the venter sparsely rugulose, finely granulate, minutely bristly, keeled its whole length, the dorsum keeled distinctly near the apex and obscurely toward the base, densely granulate and rugulose, the ridges uneven with tubercle-like elevations bearing solitary or rarely grouped but separate bristles, these barbed near the tip; scar rotund, basal, somewhat stipitate.

Type in the U. S. National Herbarium, no. 880492, collected at Corcoran, Tulare County, California, March 24, 1914, by Miss Alice Eastwood (no. 2874). Specimens of the same collection are in the Gray Herbarium and the herbarium of the California Academy of Sciences.

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: San Diego, *Greene*, May, 1885 (G). Elsinore Lake, Riverside County, *Johnston* 1981, April 27, 1918 (G).

LOWER CALIFORNIA: Northern part, *Orcutt* 2260, April 21, 1886 (N, B).

The San Diego specimen might be considered the type of *A. humistrata* Greene, since it is labeled *A. humistrata* by Dr. Greene, but the original description of that species agrees much better with a specimen from Antioch, which also was included

21. Allocarya asperula Piper, sp. nov.

Annual, somewhat succulent, the stems erect or ascending, simple or sparingly branched, 10 to 30 cm. high, very sparsely strigillose; leaves linear, glabrous above, strigillose beneath, 1 to 2 cm. long; racemes at length very loose, subsecund, most of the flowers bracteate; pedicels very short; calyx sparsely setulose, markedly accrescent, becoming 5 mm. long, about one-sixth as long as the internodes; corolla minute; nutlets lanceoloid, 2.2 to 2.5 mm. long, 1 mm. broad, compressed and reduced above the middle, the dorsum keeled one-third to one-half its length, densely granulate and sharply rugose-reticulate, bristly on the ridges (especially toward the tip), the slender bristles scattered or in penicillate tufts of 2 to 4, all armed near the tip with short divaricate barbs, the venter keeled, granulate in faint lines or ridges as well as bristly; scar nearly basal, ovate, flange-margined.

Type in the U. S. National Herbarium, no. 219624, collected near Cypress Hills, Saskatchewan, July 26, 1880, by John Macoun.

ADDITIONAL SPECIMENS EXAMINED:

SASKATCHEWAN: Cypress Lake, *Macoun* 5805, June 30, 1894 (G).

WYOMING: Fort Bridger, *Porter*, July 11, 1873 (G).

NEVADA: Clover Mountains, *Watson* 851, in part, September, 1868 (G).

Closely related to *A. leptoclada* Greene, but the nutlet bristles of that are not barbed. The last two specimens cited were included by Dr. Gray in his *Krynitzkia californica* var. *subglochidiata*.

22. Allocarya wilcoxii Piper, sp. nov.

Annual, succulent, much branched from the base, the ascending branches 8 to 15 cm. long, very sparsely strigillose; leaves linear-oblanceolate, glabrous above, pulvinate-setulose beneath, 1 to 2 cm. long; racemes moderately loose, subsecund, some of the flowers bracted; pedicels very short and stout; calyx firm, erect, markedly accrescent and becoming thickened, the lobes sparsely pulvinate-setulose, at length 5 to 6 mm. long, mostly more than half as long as the internodes; nutlets ovoid, trigonous, 2 mm. long, the dorsum keeled at tip, obliquely rugulose and tuberculate, bearing fine solitary bristles, these barbed at tip, the venter densely granulate, not bristly, keeled its entire length; scar basal, broad, flange-margined.

Type in the U. S. National Herbarium, no. 42062, collected in Idaho, in 1883, by T. E. Wilcox.

General Wilcox informs me that the specimen was collected near Fort Boise.

23. Allocarya setulosa Piper, sp. nov.

Annual, branched from the base, the branches spreading to nearly erect, 10 to 20 cm. long; stems sparsely setulose; leaves linear-oblanceolate, acutish or obtuse, pustulate-setulose on both sides, 1 to 4 cm. long; racemes dense, 5 to 10 cm. long, some of the flowers leafy-bracted, only the lower internodes becoming longer than the fruiting calyces; pedicels shorter than the calyces; calyx lobes lanceolate, acute, strongly setulose, little accrescent, at length 4 to 5 mm. long; corolla small, slightly exceeding the calyx; nutlets lanceoloid, acute, dull, 2 mm. long, the dorsum faintly keeled above the middle, transversely rugulose with low ridges except at base, coarsely granulate in the interspaces and especially toward the base, the venter obliquely and finely rugulose as well as granulate; scar exactly basal, the margins flangelike.

Type in the U. S. National Herbarium, no. 404831, collected near Fort Klamath, Oregon, August 7, 1894, by J. B. Leiberg (no. 659). Specimens of the same collection are in the Gray Herbarium and in the herbaria of the University of California and the California Academy of Sciences.

ADDITIONAL SPECIMENS EXAMINED:

OREGON: *Howell* 45, in 1880 (N).

WASHINGTON: Klickitat, *Howell* 295, in 1880 (G).

There is a possibility that this is *A. bracteata* Howell, but Howell's description does not apply, and no authentic specimens of that species have been located.

24. Allocarya stipitata Greene, Pittonia **1**: 19. 1887.

TYPE LOCALITY: "In the central part of California." Greene included in his description both the large-flowered plant here considered typical *A. stipitata* and the smaller-flowered plant now separated as *A. stipitata micrantha*. Three specimens are marked "type" in the herbarium of the University of California, according to Mrs. T. S. Brandegee, as follows: Vallejo, *Greene*, April 20, 1874; Antioch, *Mrs. Brandegee*, April, 1883; Elmira, *Greene*, May 3, 1886. The last specimen is small-flowered, the two others large-flowered.

SPECIMENS EXAMINED:

CALIFORNIA: Elmira, *C. F. Baker* 2894, in part (E); *Greene*, May 5, 1890 (N); *Greene*, May 3, 1886 (G); *Curran*, April, 1884 (N); *K. Brandegee*, May 3, 1909 (B). Byron, *C. F. Baker* 2799, April 27, 1903 (N, E, G); *Eastwood* 3822, March 14, 1914 (N, C, G); *Eastwood* 3777, March 14, 1914 (N, C, G); *Greene*, May 23, 1889 (E); *Greene*, March 24, 1889 (E); *Bioletti*, in 1892 (E). Antioch, *Greene*, April 7, 1895 (E); *K. Brandegee*, May, 1889 (B); *Curran*, April, 1883 (E); *K. Brandegee* (B), a strongly fasciated, very succulent plant. Chico, *Austin*, April, 1896 (E, B); *Austin* 1928, May, 1897 (N, S); *Bidwell*, in 1879 (G). Nine miles from Chico, *Heller* 11317, April 27, 1894 (E, G, S, B). Livermore, *Greene*, in 1895 (E). Vallejo, *Greene* 105, April 20, 1874 (B, G). Sacramento Valley, *Greene*, May, 1883 (N). Lower Sacramento, *Greene*, May, 1890 (E). Clear Creek, Butte County, *Brown* 162, 165, April 15, 1897 (N). Fairfield, *Heller & Brown* 5377, April 26, 1902 (N, G, S). Colusa County, *Curran*, May, 1885 (G). Suisun, *Greene*, in 1886, in part (G). Anderson, *W. W. Jones* 265, April 5, 1910 (G). Benicia, *W. W. Jones* 213a, April 7, 1914 (G). Midway, Alameda County, *Greene*, May 3, 1895 (E). Taylor Mountain, Sonoma County, *M. S. Baker*, in 1898 (E). Crescent Mills, Plumas County, *Austin*, April, 1896 (E). Pitt River, *L. E. Smith* 13, March 28, 1913 (C). Goose Valley, *Eastwood* 747, in 1912 (C). Without locality, *Kellogg & Harford* 355 (C), 722 (N). Butte Creek, *Austin* 626, April 7, 1896 (B). Brentwood, *K. Brandegee*, May, 1892 (B). Elk Grove, *Drew*, April, 1882 (B). Colusa, *K. Brandegee*, April, 1889, in part (B); *Mrs. Summers* (B). Butte County, *Mrs. E. Miles*, in 1887 (B). Hollister, *Setchell*, April 14, 1897 (B). College City, *Miss M. Alice King*, in 1905 (B). Sutter Plains, *Jepson*, April 10, 1891 (B). French Camp, *Sanford* 101 (B). Napa Junction, *Sonne*, April, 1887 (B). Eldorado to Placerville, *Heller* 12303, April 7, 1911 (S). Williams, *Ferris* 533, April 12, 1917 (S). Dunnigan, Yolo County, *Ferris* 701, April 20, 1917 (S).

24a. Allocarya stipitata micrantha Piper, subsp. nov.

Corolla small, 2 to 4 mm. broad; otherwise as in the species.

Type in the U. S. National Herbarium, no. 42061, collected at Stockton, California, April 28, 1889, by E. L. Greene.

SPECIMENS EXAMINED:

CALIFORNIA: Tres Pinos, San Benito County, *Eastwood* 6917, May 14, 1918 (C). Blockman's Ranch, Mariposa County, *Eastwood* 4307, April 18, 1915 (C). Merced, *Eastwood* 4396, 4396a, April 23, 1915 (C). Zimmerman's, Contra Costa County, *Brewer* 1188, July 31, 1862, unusually fleshy and the branches fasciated (N, B). Bethany, *C. F. Baker* 2788, April 27, 1903 (N, G, E). Antioch, *Heller* 8885, April 16, 1908 (N, G, S); *Curran*, May 9, 1886 (G); *Davy* 946, April 7, 1895 (B). Angel Island, *W. F. Schmidt*, in 1913 (N). Six miles north of Chico, *Heller* 11470, May 30, 1914 (G, E, S). Madrone, *Jepson*, June 1, 1896 (G). Fairfield, *Heller & Brown* 5375, April 26, 1902 (G, N, S). Chapman Schoolhouse, Mariposa County, *Congdon* 53, very slender, with scarcely accrescent calyx (G). Sacramento Valley, *Greene*, May, 1883 (E).

Elmira, *Curran*, May, 1885 (G); *Greene*, May 3, 1886 (B); *C. F. Baker* 2894, in part (E); *K. Brandegee*, May 3, 1909 (B); *K. Brandegee*, April, 1883 (B). Mendota, *Dudley*, April 19, 1903 (S). Sacramento, *Edna Hannibal*, April 7, 1918 (S). Wallace, *McMurphy*, May 28, 1914 (S). Williams, *Ferris* 534, April 12, 1917 (S). Hollister, *Setchell*, April 14, 1897 (S). Byron, *K. Brandegee*, April, 1887 (B). Boca, *K. Brandegee* (B). Colusa, *K. Brandegee*, April, 1889, in part (B). Campo, San Diego County, *Parish* 10814, May 9, 1916 (B). Yosemite Valley, *Hall* 8875, June 7, 1911 (B). Stockton, *H. P. Fitch*, April 25, 1889 (B). Suisun, *K. Brandegee*, May 3, 1892 (B). Goshen, *Setchell*, June 23, 1897 (B).

LOWER CALIFORNIA: Northern Lower California, *Orcutt* 2259, April 6, 1886 (N).

Dr. Greene included this in his original description of *A. stipitata*, but it has seemed most consistent to consider the large-flowered plant as the type he had in mind. Intergrades are apparently rare between the two, but the nutlet characters are identical.

25. Allocarya glabra (A. Gray) Macbride, Proc. Amer. Acad. **51:** 543. 1916.

Lithospermum glabrum A. Gray, Proc. Amer. Acad. **17:** 227. 1882.

Allocarya salina Jepson, Fl. West. Mid. Calif. 442. 1901.

TYPE LOCALITY: "Arizona, *Lemmon*," but this is in all probability an error, according to Mrs. Brandegee (Zoe **5:** 94). Type of *A. salina* (not examined) collected on "margin of salt marshes, Alvarado," California.

SPECIMENS EXAMINED:

ARIZONA: Apache Pass, *Lemmon* 485, in 1881 (G).

CALIFORNIA: Los Gatos, *Evelina Cannon*, June, 1894 (C). Mount Eden, *K. Brandegee*, June 16, 1893, and April 17, 1890 (B).

Allocarya glabra and the unusually succulent forms of *A. stipitata micrantha* may be distinguished by the nutlet characters, as follows:

A. glabra.—Nutlets finely and obscurely granulate beneath, their magins rather sharp and with a conspicuous entire narrow border.

A. stipitatata micrantha.—Nutlets coarsely and conspicuously granulate beneath, their margins not acute but with an obscure, not entire border.

26. Allocarya leibergii Piper, sp. nov.

Annual, somewhat succulent, branched below, the ascending branches 15 to 30 cm. long, minutely strigillose; leaves linear, glabrous above, pulvinate-setulose beneath, about 2 cm. long; racemes bractless, subsecund, rather closely flowered, the fruiting calyces nearly as long as the internodes; calyx setulose, not pulvinate, somewhat accrescent, the lobes erect, at length 3 to 5 mm. long; nutlets broadly lanceoloid, abruptly compressed above the middle, 2 to 2.2 mm. long, the dorsum keeled near the tip, rugulose and granulate, the venter keeled its entire length and reticulately rugulose; scar basal, rounded, flange-margined.

Type in U. S. National Herbarium, no. 621087, collected at margins of summer pools, Medford, Oregon, June 18, 1899, by J. B. Leiberg (no. 4120).

27. Allocarya tuberculata Piper, sp. nov.

Annual, somewhat succulent, branched from the base, the ascending branches minutely and very sparsely strigillose, 10 to 30 cm. long; leaves oblanceolate, obtuse, sparsely strigillose on both sides, 1 to 2 cm. long; racemes subsecund, loosely flowered, bracteate below, the fruiting calyces mostly one-fourth as long as the internodes; pedicels very short and stout; calyx sparsely strigillose, decidely accrescent, becoming thickened, the lobes erect or curved, at length 4 to 5 mm. long; nutlets lanceoloid, somewhat compressed above the middle, 2.3 mm. long, the dorsum keeled half its length and tuberculate, the venter obscurely rugulose; scar basal, round, somewhat stipitate.

Type in the U. S. National Herbarium, no. 404778, collected at Pine Creek, Gilliam County, Oregon, altitude 740 meters, June 7, 1894, by J. B. Leiberg (no. 166). Specimens of the same collection are in the Gray Herbarium and in the herbaria of Stanford University and the University of California.

28. Allocarya orthocarpa Greene, Pittonia **4**: 235. 1901.

TYPE LOCALITY: "Cache Valley, Utah, *Miss Mulford.*" Type in the Greene Herbarium.

SPECIMENS EXAMINED:

UTAH: Type specimen, as above. Great Salt Lake, *Coulter*, in 1872 (N).
COLORADO: Middle Park, *Parry* 4, in 1864 (G). Golden, *Greene*, June 4, 1870 (G).
MONTANA: Lower Sand Coulee, *Williams* 777 (N). Midvale, *Umbach* 298 (N).
WASHINGTON: Klickitat, *Howell* 336, June, 1879 (G). Tshimikaine, *Geyer* 548, in part (G).

29. Allocarya charaxata Piper, sp. nov.

Annual, branched from the base, somewhat succulent, the branches mostly simple, divergent or ascending, 10 to 25 cm. long; stems sparsely strigillose; leaves linear, slightly broader toward the tip, obtuse or acute, glabrous above, sparsely strigillose beneath, 2 to 5 cm. long; racemes loose, the internodes about 4 times as long as the calyces, the lower flowers leafy-bracteate; pedicels shorter than the calyces; calyx moderately accrescent, at length 5 mm. long, the lobes erect, lanceolate, obtuse, sparsely strigillose; corolla 1.5 mm. broad; nutlets lanceoloid, 1.7 mm. long, the dorsum keeled from about the middle, rugulose with prominent transverse broken ridges except at base, the interspaces sparsely granulate, the venter keeled, sparsely granulate, not at all rugulose; scar basal, triangular, variable in size in the same cluster, sometimes flange-margined.

Type in the U. S. National Herbarium, no. 880527, collected at Guernsey, Tulare County, California, March 25, 1914, by Alice Eastwood (no. 3881, in part). Specimens of the same collection are in the herbarium of the California Academy of Sciences and in the Gray Herbarium.

30. Allocarya ambigens Piper, sp. nov.

Annual, branched from the base, the rather stout, spreading to erect branches mostly simple, 15 to 20 cm. long; stems sparsely strigillose; leaves linear-oblong, obtusish, glabrous or nearly so above, strigillose and usually pustulate beneath, 1 to 4 cm. long; racemes strict, the internodes 2 to 4 times as long as the calyces, a few of the lower flowers leafy-bracteate; pedicels shorter than the calyces; calyx rather thick, slightly accrescent, at length 4 mm. long, the lobes erect, lanceolate, acute, strigillose; corolla small, slightly exceeding the calyx; nutlets lanceoloid, 2 mm. long, the dorsum rather flat, keeled from about the middle, transversely rugulose with low entire ridges, coarsely granulate or finely tuberculate in the interspaces, especially near the base, the venter keeled and obliquely rugulose with low oblique ridges; scar narrow, oblique but suprabasal.

Type in the Gray Herbarium, collected between Vinton and Beckwith, Plumas County, California, July 2, 1907, by A. A. Heller and P. B. Kennedy (no. 8682). Specimens of the same collection are in the U. S. National Herbarium and the herbarium of the University of California. Heller and Kennedy's no. 8681, from the same locality, is also of this species.

The following additional collections from California are referred here with some doubt: Howell Mountain, Napa Basin, *Jepson*, May 8, 1893 (B); San Luis Obispo County, *Mrs. Summers* (B).

This species is quite intermediate between the *Californicae* and the *Stipitatae*.

31. Allocarya lonchocarpa Piper, sp. nov.

Annual, branched from the base, the branches ascending, 10 to 20 cm. long; stems sparsely strigillose; leaves linear-oblanceolate, acutish, nearly glabrous above, strigillose beneath, 1 to 3 cm. long; racemes rather loose, the internodes 2 to 4 times as long as the calyces, most of the flowers leafy-bracted; pedicels shorter than the calyces; calyx slightly accrescent, strigillose, the lobes somewhat spreading, lanceolate, acute, at length 5 mm. long; corolla minute; nutlets narrowly lanceoloid, 2.2 mm. long, the dorsum rather flat, keeled near the apex, rugulose with 4 or 5 fine transverse ridges, coarsely granulate in the broad interspaces, the venter keeled and recticulately rugulose; scar oblique, lanceolate.

Type in the U. S. National Herbarium, no. 517636, collected in wallows filled with water, Aurora County, South Dakota, June, 1873, by E. N. Wilcox.

32. Allocarya scripta Greene, Pittonia **1:** 142. 1887.

TYPE LOCALITY: "Somewhere on the plains of the Sacramento, Calif." Type in the Greene Herbarium; the only collection seen.

A unique species, the type specimens not quite mature. The scar is apparently deep and excavate and about one-third as long as the nutlet. The plant therefore shows relationship to the *Echinaceae* and *Glyptocarpae*.

33. Allocarya limicola Piper, sp. nov.

Annual, branched from the base, somewhat succulent; branches ascending, minutely and sparsely strigillose, 10 to 15 cm. long; leaves oblanceolate, obtuse, glabrous above, strigillose beneath, 1 to 3 cm. long; racemes loose, the internodes 3 to 5 times as long as the fruiting calyces, the lower flowers leafy-bracteate; calyx strongly accrescent, the lanceolate acute lobes at length thick, spreading or twisted, 6 to 7 mm. long; corolla about 2 mm. broad; nutlets broadly ovoid, 2 mm. long, the dorsum convex, keeled its whole length, transversely rugulose with low fine ridges, the large interspaces coarsely granulate and (under the microscope) covered with nearly sessile glochidia; venter keeled its whole length, rugulose with a few short oblique ridges, and granulate; scar triangular, nearly basal.

Type in the Gray Herbarium, collected in the San Joaquin Valley, California, May, 1884, by E. L. Greene.

34. Allocarya sigillata Piper, sp. nov.

Annual, branched from the base, the numerous slender branches 20 to 40 cm. long; stems strigillose; leaves linear to linear-spatulate, acute, glabrous above, strigillose beneath, 5 to 10 cm. long; racemes loose, some of the flowers bracteate; pedicels shorter than the calyces; corolla small, not exceeding the calyx; calyx markedly accrescent, the lobes at length 4 times as long as the nutlets; nutlets ovoid, 1.7 mm. long, the dorsum convex, keeled its whole length, transversely rugulose with low broken ridges, densely granulate in the interspaces, bearing a few tufts of short bristles mostly on the margins and keel, the venter rugulose and granulate, keeled its whole length; scar small, ovate, obliquely basal; bristles hyaline, divaricately barbed at tip.

Type in the Greene Herbarium, no. 21877, collected at Antioch, California, April 7, 1885, by E. L. Greene.

Somewhat intermediate between *A. scripta* Greene and *A. humistrata* Greene, but probably nearest related to *A. trachycarpa*.

35. Allocarya humistrata Greene, Pittonia **1:** 16. 1887.

TYPE LOCALITY: "Frequent from San Diego throughout the state" of California.

SPECIMENS EXAMINED:

CALIFORNIA: Near Antioch, *Curran*, in 1884 (B, C); marked "type" in the herbarium of the California Academy of Sciences, and "part of type" in the herbarium of the University of California. Byron Springs, *Eastwood*, April 14, 1914 (C). Colusa, *Brandegee*, April, 1889, in part (N); *Brandegee*, April, 1888 (B); *Curran*, April, 1884 (G).

No specimen from San Diego marked "type" has been found. It is possible, from the San Diego locality, that the name *A. humistrata* Greene should really be applied to *A. divergens* Piper, as specimens of the latter were collected at San Diego by Dr. Greene.

36. Allocarya cryocarpa Piper, sp. nov.

Annual, loosely few-branched, 5 to 15 cm. high; stems slender, strigillose; leaves linear, acute, strigillose on both sides, 1 to 3 cm. long; racemes very loose, the internodes in fruit 4 to 8 times as long as the calyces, some of the lower flowers bracteate; pedicels shorter than the calyces; calyx not accrescent, the lanceolate acute lobes setulose, 2 mm. long; corolla very small, barely exceeding the calyx; nutlets ovoid, 1.8 mm. long, the dorsum keeled near the apex, tuberculate-rugulose, densely granulate in the interspaces, the tubercles bearing short unarmed hyaline bristles, the venter keeled its whole length, rugulose and granulate; scar lanceolate to linear, one-fourth as long as the nutlet; epidermis of nutlets very muriculate, a few of the muriculations glochidiate.

Type in the herbarium of the California Academy of Sciences, collected near Lily Lake, Glen Alpine region, California, in 1906, by Alice Eastwood (no. 895).

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: Leontes Meadows, Bridgeport and Sonora road, *Congdon*, August 4, 1898 (G). Truckee, *Heller* 7055a, in part, July 20, 1903 (G).
OREGON: Blue Mountains, *Sheldon* 8380 (N).

37. Allocarya gracilis Piper, sp. nov.

Annual; stems few-branched at base, erect, slender, not succulent, very sparsely strigillose, 25 to 30 cm. high; leaves linear, acute, almost glabrous above, sparsely strigillose beneath, 2 to 5 cm. long; racemes subsecund, bractless or with one or two bracts below, loose, the internodes 4 to 6 times as long as the fruiting calyces; pedicels shorter than the calyces; calyx lobes lanceolate, acute, strigillose, erect or ascending, little longer than the nutlets, 2 to 3 mm. long; corolla 4 to 5 mm. broad; nutlets ovoid, obtuse, thick, dull, 1.5 mm. long, the dorsum convex, keeled near the apex, obliquely rugulose and somewhat reticulate, the rather large interspaces granulate, the hole covered with sessile microscopic glochidia, the venter rugulose, keeled from scar to apex; scar lateral, linear, raised, one-third as long as the nutlet.

Type in the herbarium of the University of California, no. 54555, collected at Deer Flat, Shasta County, California, June, 1903, by Hall and Babcock (no. 4276).

38. Allocarya laxa Piper, sp. nov.

Annual; stems weak, decumbent, not succulent, 20 to 25 cm. long, sparsely strigillose; leaves linear, acute, sessile or nearly so, 2 to 3 cm. long, thin, very sparsely strigillose-setulose on both faces; racemes very loose, 10 to 15 cm. long, subsecund, bractless or occasionally bracted; pedicels shorter than the calyx lobes; calyx lobes lance-linear, acute, very sparsely strigillose, 2 to 3 mm. long, enlarging somewhat and erect or spreading in fruit; corolla 4 to 5 mm. broad; nutlets 1.5 mm. long, ovoid, pale, the dorsum keeled near the tip, bearing about 20 evenly scattered, stout, conical prominences, these as well as the whole surface densely covered with short hyaline bristles each with spreading barbs at apex, the venter keeled its entire length, sharply rugulose and granulate; scar lateral, broadly ovate, concave, one-fourth as long as the nutlet.

Type in the U. S. National Herbarium, no. 324695, collected on the south side of Mount Shasta, California, August 1 to 15, 1897, by H. E. Brown (no. 590).

Also collected near Redding, California, May 30, 1905, by A. A. Heller (no. 7908; G, S). A single bract occurs on one raceme of a plant of this collection.

39. Allocarya pratensis Piper, sp. nov.

Annual; stems few-branched at base, erect or ascending, slender, not succulent, very sparsely strigillose, 10 to 25 cm. high; leaves linear, acute, strigillose, especially beneath, 2 to 5 cm. long; racemes subsecund, bractless, loose, the internodes 3 to 5 times as long as the fruiting calyx; pedicels shorter than the calyces; calyx lobes ascending, lance-linear, acute, strigillose, 3 mm. long; corolla 4 to 5 mm. broad; nutlets ovoid, acute, 1.7 mm. long, the dorsum keeled toward the tip, obliquely dentate-rugulose or the ridges separated into tubercles, covered with short hyaline bristles, these unarmed or, especially on the tubercles, barbed at tip, the venter obliquely rugulose, keeled from scar to apex; scar lateral, lanceolate.

Type in the herbarium of the University of California, no. 54554, collected in a meadow near Bear Creek, northeastern Shasta County, California, June, 1903, by Hall and Babcock (no. 4162).

40. Allocarya hispidula Greene, Pittonia **1:** 17. 1887.

TYPE LOCALITY: "San Bernardino Mountains, Calif. (*Parish*, no. 1470), northward to Oregon (*T. J. Howell*)."

SPECIMENS EXAMINED:

CALIFORNIA: Bear Valley, San Bernardino Mountains, *Parish* 1470, August, 1882 (C, N, G); *Parish* 3247, June 24, 1894 (N, G). San Bernardino Mountains, Talmadge Mill, *Parish* 3239, June 28, 1894 (N). Seeley's Flat, San Bernardino Mountains, *Parish* 2433, June 6, 1892 (G). Donner Lake, lower end, *Heller* 6891, in part, July 10, 1903 (N). Sierra County, *Lemmon* 492, in 1874 (G). Mountain Lake, Tulare County, *Dudley* 871, July 22, 1895 (S). Volcano Creek, Tulare County, *Hall & Babcock* 5318, July, 1904 (B). Connell Meadows, Tulare County, *Hall & Babcock* 5115, June 15, 1904 (B). Shackelford Canyon, Siskiyou County, *Chandler* 1704, June, 1901 (B). Prattville, *Brandegee*, July 3, 1892 (B).

NEVADA: Galena Creek, Washoe County, *Kennedy* 1228, August 1, 1906 (N, B).

OREGON: Fox Valley, Blue Mountains, *Griffiths & Hunter* 160, July, 1902 (N).

WASHINGTON: Waitsburg, *Horner* 360, in part, May 4, 1897 (N). Ellensburg, *Whited* 654, June 5, 1898 (N). Falcon Valley, *Suksdorf* 2113, May 27, 1892 (N, C, B). Harrington, *Sandberg & Leiberg* 217, June 14, 1893 (N, G).

IDAHO: Tamarack, *Clark* 210, August 8, 1911 (G, S, in part). St. Anthony, *Merrill & Wilcox* 832, July 5, 1901 (G).

41. Allocarya tenera Greene, Pittonia **3:** 109. 1896.

TYPE LOCALITY: "Adam's Springs, Lake County, California," *Mrs. E. Booth*, July, 1894. Type in the Greene Herbarium.

SPECIMENS EXAMINED:

CALIFORNIA: Type, as above (E). Fall River Springs, Shasta County, *Hall & Babcock* 4184, June, 1903 (N). Chico Meadows, *Heller* 11496, June 22, 1914 (G, S, in part); *Heller* 11969, June 11, 1915 (G, S). Lake Valley, Lake Tahoe, *Abrams* 4770, July 27, 1911, in part (G, S). Fallen Leaf Lodge, Lake Tahoe, *Abrams* 4876, July 30, 1911 (G). Burney, Shasta County, *Eastwood*, June 28, 1912, in part (C). Bear Flat, Shasta County, *Hall & Babcock* 4155, June, 1903 (B).

OREGON: Buck Lake, Klamath County, *Coville & Applegate* 66, July 24, 1897 (N).

42. Allocarya penicillata Greene, Pittonia **1:** 18. 1887.

TYPE LOCALITY: "Donner Lake in the Sierra Nevada, Calif."

SPECIMENS EXAMINED:

CALIFORNIA: Donner Lake, *Greene*, August, 1883 (C, E, G); *Heller* 6891, in part, July 10, 1903 (G, S); *K. Brandegee*, September, 1888 (B). Mount Shasta, *Palmer* 2447, July, 1892 (N). Sissons, *Brandegee*, July, 1899 (B). Truckee,

Hitchcock 238, in part, July 14, 1913 (N). Tioga Road, Tuolumne County, *Congdon* 46, June 8, 1897 (G). Sunnyside, Lake Tahoe, *Eastwood* 26, in 1909 (C). Camp Agassiz, Glen Alpine region, *Eastwood* 948, in 1906 (C). Fallen Leaf Lake, *Eastwood* 1066, in 1906 (C). Fallen Leaf Lodge, *Abrams* 4876, July 30, 1911 (S). Loyalton, Sierra County, *Eastwood* 7895, in part, June 27, 1918 (C). Webber Lake, *Kennedy & Doten* 117, July 8, 1901 (B). Summit Soda Springs, Placer County, *Eastwood*, June 12, 1898 (B). Morgan, Tehama County, *Hall & Babcock* 4365, July 1 or 2, 1903 (B). Chico Meadows, Butte County, *Heller* 11496, in part, June 22, 1914 (S). Pine Ridge, Fresno County, *Hall & Chandler* 282, July, 1900 (S, N). Redrock Meadows, Tulare County, *Hall* 8397, July 19, 1908 (B). Chagoopa Creek, Tulare County, *Dudley* 2256, July 24, 1897 (S). Funston Meadows, Tulare County, *Dudley* 2185, July 27, 1897 (S). Whitney Meadows, Tulare County, *Dudley* 2497, August 8, 1897 (S).

NEVADA: Carson City, *Purpus*, in 1889 (B).

The Tulare County specimens may be distinct. Their nutlets are smaller and narrower, and not so prominently sculptured on the back nor with so many ridges on the venter, nor are the edges sharp margined, while the scar is lanceolate and not linear as in the type of the species.

43. Allocarya cervina Piper, sp. nov.

Annual, not succulent, much branched from the base, the branches prostrate to ascending, 10 to 20 cm. long, the whole herbage densely strigillose; leaves linear, acute, 1 to 2 cm. long, strigillose on each surface, more so beneath; racemes moderately dense, subsecund, 5 to 10 cm. long, bractless or with occasional leafy bracts; pedicels shorter than the calyces; calyx lobes lance-linear, acute, erect, loosely setulose, 2 mm. long, not enlarging in fruit, mostly about half as long as the internodes; corolla very small, 1 mm. broad; nutlets ovoid, acutish, dull, brownish gray, 1.5 to 1.7 mm. long, the dorsum convex, obscurely keeled near the apex, densely and evenly granulate and with about four sinuous transverse ridges, the granulations each tipped with a slender, hyaline, irregularly branched bristle, these longest near the margins, the venter keeled its whole length, obliquely reticulate-rugulose and minutely bristly; scar nearly basal, broadly triangular.

Type in the U. S. National Herbarium, no. 611646, collected in sand, near Redding, California, May 29, 1905, by A. A. Heller (no. 7891).

A specimen of the same collection is in the Gray Herbarium. Distributed as *A. californica* (Fisch. & Mey.) Greene.

44. Allocarya ramosa Piper, sp. nov.

Annual, branched from near the base, not succulent, the branches prostrate to curved-ascending, 10 to 30 cm. long, sparsely strigillose; leaves linear, acute, glabrous or nearly so above, strigillose beneath, 1 to 5 cm. long, reduced upward; racemes slender, loose, 5 to 20 cm. long, some of the flowers in the axils of leafy bracts; pedicels mostly shorter than the calyx lobes; calyx lobes lance-oblong, acute, erect, setulose, 2 to 2.5 mm. long in fruit, one-fourth to one-third as long as the internodes; corolla 2 mm. broad; nutlets dull brown, ovoid, acutish, 2 mm. long, the dorsum rounded, densely granulate and with fine transverse broken ridges, minutely bristly, especially near the tip, the bristles hyaline, elongate, irregularly branched or occasionally forked near the apex, the short branches spreading, the venter keeled its entire length, marked with anastomosing ridges, and minutely bristly; scar suprabasal, narrowly pyriform, one-fifth as long as the nutlet.

Type in the U. S. National Herbarium, no. 287604, collected near Prineville, Oregon, in the Crooked River Valley, June 23, 1894, by J. B. Leiberg (no. 318).

Specimens of the same collection are in the Gray Herbarium and in the herbarium of Stanford University.

ADDITIONAL SPECIMENS EXAMINED:

WASHINGTON: Waitsburg, *Horner* 360, in part, in 1897 (G). Wenaha Forest, Blue Mountains; *Darlington* 261, July, 1913 (G). Without locality, *Brandegee* 989, in 1883 (B).

OREGON: Without locality, *Henderson* (G). Eastern Oregon, *Cusick* 1754, in 1897 (N, S, in part, B). Stinking Water Creek, *Leiberg* 2346, June 21, 1896 (N, G, B). Laidlaw, *Whited* 3090, July 17, 1906 (N). Blue Mountains, *Sheldon* 8436 (N).

IDAHO: Coeur d'Alene, *Rust* 372, August 11, 1913 (N). Boulder Creek, Owyhee County, *Macbride* 517, July 31, 1910 (G, N, S, B). Soldier Mountain, *Henderson* 3194, July 16, 1895 (N). House Creek, Owyhee County, *Macbride* 1805, June 29, 1912 (N). Dry Creek, *Palmer* 326, July 13, 1893 (N). Tamarack, *Clark* 210, August 8, 1911 (S, in part).

UTAH: Altus, *Mrs. Clemens*, July 7, 1908 (S).

45. Allocarya hirta Greene, Pittonia **1:** 161. 1888.

TYPE LOCALITY: "Umpqua Valley, Ore., *Howell*, June 25, 1887."

SPECIMENS EXAMINED:

OREGON: Umpqua Valley, *Howell*, June 25, 1887 (N, B). Wimer, Jackson County, *Hammond* 296, May 17, 1892 (N).

46. Allocarya calycosa Piper, sp. nov.

Annual, erect, sparingly branched, 30 cm. high; stems strigillose; leaves few, linear, acutish, loosely pustulate-setulose on both sides, 2 to 4 cm. long; racemes bractless, 10 to 20 cm. long, the internodes 2 to 4 times as long as the fruiting calyces; pedicels shorter than the calyces; calyx lobes oblong-lanceolate, acutish, erect, loosely pustulate-setulose, 5 mm. long in fruit; corolla 6 to 7 mm. broad; nutlets ovoid, tumid, dull, 1.5 mm. long, the dorsum keeled its whole length, obscurely marked with dentate fine transverse ridges and densely coarse-granulate, the venter keeled its whole length and obliquely rugulose with many entire ridges, these forked near the margin of the nutlet; scar ovate, lateral, one-fourth as long as the nutlet.

Type in the University of Oregon herbarium, collected in the Umpqua Valley, Oregon, June, 1887, by T. J. Howell.

Very near *A. hirta* Greene, but differing in the looser racemes, larger calyx, and the sculpturing of the nutlets.

47. Allocarya figurata Piper, sp. nov.

Annual, erect, loosely and mostly dichotomously branched, 15 to 25 cm. high; stems slender, strigillose; leaves linear, acute, rather coarsely strigillose on both sides, 2 to 5 cm. long; racemes bractless, 5 to 12 cm. long, the internodes mostly about twice as long as the fruiting calyces; pedicels shorter than the calyces; calyx not accrescent, the lance-linear, acutish, somewhat spreading lobes loosely strigillose, about 3 mm. long; corolla rotate 3 to 5 mm. broad; nutlets ovoid, barely acute, dull, 1.5 mm. long, the dorsum convex, faintly keeled its whole length, transversely dentate-rugulose with about 5 low ridges, the interspaces granulate, the venter keeled its whole length and obliquely rugulose; scar suprabasal, ovate, seated with the base of the keel in a shallow depression surrounded by a conspicuous ridge; epidermal cells produced into very short conical trichomes, each with one or more minute terminal cells.

Type in the Gray Herbarium, collected at Frye's Ranch, Illahe, Curry County, Oregon, June 25, 1917, by J. C. Nelson (no. 1509).

48. Allocarya vallata Piper, sp. nov.

Annual, erect, 15 to 40 cm. high, simple at base, usually few-branched above; stems almost glabrous, very sparsely strigillose; leaves linear or lance-linear, acutish, glabrous or sparsely strigillose above, strigillose and more or less pustulate beneath,

1 to 5 cm. long; racemes bractless, many-flowered, the internodes 2 to 4 times as long as the calyces; pedicels shorter than the calyces; calyx strigillose, the lobes lanceolate, erect, 2 to 3 mm. long, a little exceeding the nutlets; corolla well exceeding the calyx, 6 to 7 mm. broad; nutlets ovoid, dark, 2 mm. long, the dorsum obscurely keeled, densely covered with granulations and more sparsely with pale tubercles, or the tubercles forming obscure ridges, the venter rugulose and granulate, the keel fully exposed but the basal part in a shallow groove; scar lateral, narrowly ovate, in a shallow pit surrounded by the free edges of the nutlet.

Type in the herbarium of the California Academy of Sciences, collected in Goose Valley, Shasta County, California, June 29 to July 11, 1912, by Alice Eastwood (no. 718). Nos. 746 and 718a of the same collector, from the same locality, also belong here.

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA; Near Redding, Shasta County, *Heller* 7908, May 30, 1905 (N). Upper Sacramento, *Parkinson* (N). Without locality, *Newberry*, collected on Williamson's Expedition (N). Prattville, Plumas County, *Austin*, June, 1878 (G).

Very closely allied to *A. scouleri* (Hook. & Arn.) Greene, but the flowers are smaller, the nutlets are narrowea and less rugulose, and the somewhat circumvallate scar is different. This species and *A. hirta* Greene form connecting links to the species with a deep ventral groove. In all three the surface of the nutlets shows under the microscope a very dense cellular scabridity. All of the specimens seen are from northern California.

49. Allocarya scouleri (Hook. & Arn.) Greene, Pittonia **1:** 18. 1887.

Myosotis scouleri Hook. & Arn. Bot. Beechey Voy. 370. 1840.

Eritrichium ? scouleri A. DC. in DC. Prodr. **10:** 130. 1846.

Krynitzkia scouleri A. Gray, Proc. Amer. Acad. **20:** 267. 1885.

TYPE LOCALITY: Columbia River.

SPECIMENS EXAMINED:

BRITISH COLUMBIA: Nanaimo, *Cooley*, July 19, 1891 (G, N). Victoria, *Fletcher*, May, 1885 (G).

WASHINGTON: Without locality, *Cooper* (N). Western Klickitat County, *Suksdorf* 177 (E). Near Union City, *Piper* 1053 (G). Seattle, *Meany* 531; *Piper*, in 1885. Succotash Valley, *Piper*, in 1895. Western Klickitat County, *Suksdorf* 105, May 26, 1881 (N); *Suksdorf* 45,[1] May 26, 1881 (G).

OREGON: Without locality, *Kellogg & Harford* 767 (N); *Howell* 46, in 1880 (N); *Mullen's Expedition* (N); *Hall* 408, 406 (G); *Howell* 339, in 1880 (G); *Howell*, in 1881 (E, B). Gladstone, *Piper* 6190, June 9, 1904 (N, G); *Howell* 427, June, 1894 (B). Myrtle Point, *Holzinger* 58, July 3, 1893 (N). Wimer, Jackson County, *Hammond* 297a, May 27, 1893 (N). Oregon City, *Lyon* 62, June 11, 1905 (N). Salem, *Hall* 206, in 1871 (N). Oakland, April, 1875 (N). Grants Pass, *Heller* 10026 (E). Chemawa, *Nelson* 1207 (G). Rogue River, *Cusick* 4621, May 7, 1915. Woodville, *J. Howell*, May, 1889. Portland, *Gorman* 4125, June 30, 1917. Lake Labish, *Gorman* 4057, May 26, 1917 (S).

50. Allocarya lithocarya Greene, Pittonia **1:** 12. 1887.

Krynitzkia lithocarya Greene; A. Gray, Proc. Amer. Acad. **20:** 265. 1885.

TYPE LOCALITY: "Lakeport, Lake County, California, 1884, *Mrs. Layne-Curran.*"

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[1] This was referred by Dr. Greene (Pittonia **1:** 16. 1887) to *A. hirta*, but the nutlet characters are those of *A. scouleri*, while the pubescence is intermediate toward *A. hirta*.

Type in the Gray Herbarium.

SPECIMENS EXAMINED:

CALIFORNIA: Lakeport, Lake County, *Curran*, May, 1884 (C, E, G, B). Potter Valley, Mendocino County, *Purpus*, April, 1889 (N); *Purpus*, April, 1899 (N, B). Big River, Mendocino County, *McMurphy*, April, 1903; immature and very doubtful (N, S).

51. Allocarya chorisiana (Cham.) Greene, Pittonia **1:** 13. 1887.

Myosotis chorisiana Cham. Linnaea **4:** 444. 1829.

Eritrichium chorisianum DC. Prodr. **10:** 130. 1846.

Krynitzkia chorisiana A. Gray, Proc. Amer. Acad. **20:** 267. 1885.

Eritrichium connatifolium Kellogg, Proc. Calif. Acad. **2:** 103. 1863. Type in the herbarium of the California Academy of Sciences; in flower.

TYPE LOCALITY: San Francisco, California.

SPECIMENS EXAMINED:

CALIFORNIA: Near San Francisco, *Torrey* 334, in 1865 (G, N); *Kellogg & Harford* 769 (N); *H. Mann* (G); *Bolander* 149, in 1864 (G); *Miss E. Cannon*, in 1891 (C); *Kellogg*, in 1866 (N); *Vasey*, in 1870 (G). Mount Olympus, San Francisco, *Miss E. Cannon* (C). Monterey, *Elmer* 4674, April, 1903 (N). Cypress Point, Monterey, *Gray*, in 1885 (G); *Eastwood* 68, May 28, 1912 (C). Pacific Grove, *Elmer* 4674, April, 1905 (C); *Heller*, May 10, 1903 (G). Crystal Springs Lake, San Mateo County, *C. F. Baker* 429, March 30, 1902 (N, E, G). Lake Merced, *Heller* 8439, April 20, 1907 (N, G, S). Belmont, *Greene*, May 10, 1886 (N, E, G). Mission Hills, *Bioletti*, in 1893 (E). San Gregorio, *C. F. Baker* 503 (E). Montara Point, *Copeland* 3322, 3339 (E). Oakland, *Rattan*, April 3, 1867 (S); *K. Brandegee*, April, 1890 (B). Pescadero Ranch, Monterey County, *Brewer* 664, May 24, 1861 (N, C, G). La Honda, *K. Brandegee*, April 9, 1892 (B). Santa Cruz, *Davy*, April 16, 1899 (B); *Helen Cone*, in 1889 (G); *Setchell*, April 15, 1897 (B). Santa Cruz Mountains, *Kellogg* (B). Colma, *Chandler* 806, March 15, 1901 (B). Searsville, *Brandegee*, May 20, 1890 (B). Ben Lomond, *K. Brandegee* April 25, 1890 (B). San Gregorio Creek. *Elmer* (B). Crystal Springs, *Eastwood*, April, 1896 (B). San Bruno Hills, *Eastwood*, June 18, 1915 (C). Granada, *Eastwood* 4717, June 13, 1915 (C). Without locality, *Coulter* 519 (G); *Hartweg*, in 1874, very young (G); *Douglas*, very young (G); *Vasey*, in 1875 (N); *Bigelow* (N); *Bolander*, in 1872 (G).

Specimens from Cedar Hill, Victoria, British Columbia, collected by Macoun, May 11, 1887, are certainly not *A. chorisiana*, and with scarcely a doubt are *A. media*.

52. Allocarya hickmanii Greene, Pittonia **1:** 13. 1887.

TYPE LOCALITY: Southern Monterey County, California. Type collected by J. B. Hickman in 1886.

SPECIMENS EXAMINED:

CALIFORNIA: Southern Monterey County, *Hickman*, in 1886 (E, C, B); a supposed duplicate in the Gray Herbarium is *A. californica*. Point Sur, *Brandegee*, July, 1888 (B).

53. Allocarya myriantha Greene, Erythea **3:** 125. 1895.

TYPE LOCALITY: Monterey, California. Type, in the Greene Herbarium, collected by E. L. Greene.

SPECIMENS EXAMINED:

CALIFORNIA: Pacific Grove, *Heller* 6748, May 18, 1903 (N, G, S); *Gwendolen Newell*, July 8, 1914 (C). Near Monterey, *Heller* 6825, June 5, 1903 (N, E, G, S); *M. R. Mann*, February 13, 1886 (E). Near Del Monte, *Heller* 6696, May 8, 1903 (N, G, S). Ojai Ranch or Gaviote Pass, *Goodale*, in 1866; young and doubtful (N). Pescadero, *Abrams* 4248, August 2, 1909 (S). Seaside, *Dudley*, April 13, 1894 (S). Joco Point, *Abrams*, May 31, 1916 (S). San Simeon, *K. Brandegee*, June 9, 1889 (B).

54. Allocarya undulata Piper, sp. nov.

Annual, branched below, the branches ascending, 20 cm. high; stems thinly strigillose; leaves linear, acutish, 1 to 4 cm. long, strigillose or pustulate-strigillose on both surfaces; racemes loose, some of the flowers bracted, the internodes 2 to 6 times as long as the calyces; pedicels shorter than the calyces; calyx densely strigillose, the lanceolate acute lobes erect, about 3 mm. long, half longer than the nutlets; corolla small, about 2 cm. broad; nutlets ovoid, 1.6 to 1.8 mm. long, black, the dorsum faintly keeled near the tip, transversely rugulose with numerous undulate low ridges, not at all granulate, the venter similarly but more reticulately rugulose, the keel fully exposed but in a shallow groove, at least basally; scar half as long as the keel, narrowly linear, lying in a narrow groove.

Type in the herbarium of the California Academy of Sciences, collected at Santa Barbara, California, May 12, 1907, by Alice Eastwood.

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: Pilarcitos Lake and Canyon, San Mateo County, *Davy* 1135, 1136, 1143, June, 1893 (B). Suisun, *K. Brandegee*, May 3, 1892 (B).

55. Allocarya minuta Piper, sp. nov.

Annual; stems erect, loosely branched above, very slender, very finely and sparsely strigillose, 6 to 20 cm. high; leaves narrowly linear, acute, 0.5 to 2 cm. long, sparsely strigillose on both sides; racemes bractless, many-flowered, 5 to 10 cm. long, the internodes 3 to 6 times as long as the calyces; pedicels very short; calyx very small, less than 2 mm. long, the lanceolate acutish strigillose lobes ascending, not accrescent; corolla 3 mm. broad, large in contrast to the calyx; nutlets ovoid, as thick as broad, obtuse, dull, 0.6 to 0.7 mm. long, the epidermal cells muriculate, the dorsum very convex, closely reticulate with low fine ridges, not granulate, keeled near the apex, the venter similarly rugulose, sulcate along the middle with a narrow shallow groove. the keel exserted and extending from the small ovate suprabasal scar to the apex.

Type in the herbarium of the University of California, collected at Fort Seward Humboldt County, California, "abundant in wet places," May 14, 1914, by J. P Tracy (no. 4469).

The exceedingly slender stems, small calyx, rather large corolla, and especially the minute nutlets make this a very distinct species.

56. Allocarya stricta Greene, Pittonia 2: 231. 1892.

TYPE LOCALITY: Calistoga, California. Type, in the Greene Herbarium, collected by E. L. Greene, April 20, 1892; duplicate in the University of California herbarium,

SPECIMENS EXAMINED:

CALIFORNIA: Calistoga, *Eastwood*, May 7, 1900 (N, B, S, G); *Eastwood* 4627, June 5, 1915 (C); *Jepson*, in 1893 (E); *Tracy* 1857 (G, B).

57. Allocarya scalpta Piper, sp. nov.

Annual, loosely branched below, 15 to 20 cm. high; branches slender, erect or ascending, strigillose; leaves linear-oblanceolate, nearly glabrous above, strigillose beneath, 2 to 3 cm. long; racemes with a few leafy bracts, loose, the internodes 4 to 8 times as long as the fruiting calyces; pedicels shorter than the calyces, a few of the lowermost elongate; calyx not accrescent, the lobes ascending, lance-linear, acutish, strigillose, about 3 mm. long in fruit; corolla 3 mm. broad; nutlets dull, ovoid, twice as long as broad, acute, 1.5 mm. long, the dorsum keeled only near the apex, closely transverse-rugulose, sometimes sparsely granulate near the base, the venter reticulate-rugulose, sulcate with a narrow groove (this most conspicuous basally), keeled from scar to apex; scar ovate, suprabasal, only one-sixth as long as the nutlet.

Type in the herbarium of the University of California, collected on Alder Point Flat, Eel River, Humboldt County, California, May 22, 1903, by J. P. Tracy (no. 1878).

58. Allocarya reticulata Piper, sp. nov.

Annual, branched from the base, the slender branches erect, strigillose, 10 to 40 cm. high; leaves linear to linear-oblanceolate, acute, nearly glabrous above, strigillose beneath, 2 to 5 cm. long; racemes with a few leafy bracts, loose, the internodes mostly 4 to 8 times as long as the calyces; pedicels mostly shorter than the calyces, a few of the lowermost ones elongate; calyx not accrescent, the lobes lance-linear, acute, setulose, ascending or spreading, about 3 mm. long in fruit; corolla 1 to 2 mm. broad; nutlets ovoid, obtusish, shiny, 1.2 to 1.3 mm. long, the dorsum convex, sometimes faintly keeled near the apex, loosely reticulate-rugulose with low ridges, the interspaces smooth, the edges rounded, the venter similarly rugulose, sulcate with an open shallow groove, at least basally, keeled from scar to apex; scar ovate, suprabasal, about one-fourth as long as the nutlet.

Type in the herbarium of the University of California, collected at Holmes Flat, Eel River, Humboldt County, California, May 3, 1916, by J. P. Tracy (no. 4691).

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: Humboldt Bay, Humboldt County, *Chandler* 1172, May, 1901 (B, N, S). Hydesville, Humboldt County, *Tracy* 4486, in part, May 30, 1914 (B).

59. Allocarya areolata Piper, sp. nov.

Annual, branched from the base, the branches erect, 15 to 25 cm. high; stems strigillose; leaves oblong-linear, obtusish, strigillose on both sides, 2 to 4 cm. long; racemes loose, the internodes 3 to 4 times as long as the calyces, some of the lower flowers bracteate; pedicels mostly much shorter than the calyces; calyx strigillose-hispid, the lanceolate acute lobes somewhat spreading, 3 mm. long, exceeding the nutlets; corolla small, 2 mm. broad; nutlets ovoid, dark, 1.5 mm. long, the dorsum keeled only near the apex, thickly and obscurely granulate, divided by low transverse ridges into a few large areoles, the venter more rugulose but not granulate, the fully exposed keel lying in a shallow groove, this deepest basally; scar narrowly ovate, suprabasal, lying in a depression surrounded by the free edges of the nutlet.

Type in the U. S. National Herbarium, no. 42064, collected at Mendocino, California, August 3, 1882, by C. G. Pringle.

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: Fort Bragg, *Eastwood* 1614, August 8, 1912 (C). Grizzly Creek, Humboldt County, *Abrams* 6026, July 11, 1916 (S). Eureka, *Tracy* 3009, July 4, 1909 (B). Gualala, *Gwendolen Newell*, July, 1904 (B). Bodega Bay, *K. Brandegee*, June, 1905 (B). Point Reyes, *Davy* 6814, June or July, 1900 (B).

60. Allocarya diffusa Greene, Pittonia **1**: 14. 1887.

TYPE LOCALITY: "San Francisco, in grassy lands about the U. S. Marine Hospital, April, 1886." Type in the Greene Herbarium.

SPECIMENS EXAMINED:

CALIFORNIA: San Francisco, *Greene*, April 12, 1886 (G, B, C, E); *Greene*, May 1, 1887 (N).

61. Allocarya cooperi (A. Gray) Greene, Pittonia **1**: 19. 1887.

Eritrichium cooperi A. Gray, Proc. Amer. Acad. **19**: 89. 1883.

Krynitzkia cooperi A. Gray, Proc. Amer. Acad. **20**: 267. 1885.

TYPE LOCALITY: "Mohave Desert, S. E. California, at Camp Cady, *Dr. Cooper*, 1860–61; Rabbit Springs, May, 1882, *P. B. & W. F. Parish*, near to and in water." Types in the Gray Herbarium.

SPECIMENS EXAMINED:

CALIFORNIA: Rabbit Springs, Mohave Desert, *Parish* 1317, May, 1882 (N, G, S). Mohave Desert, *Parish* 2431 (E). Camp Cady, *Cooper*, in 1860–61 (G). Bishop to Laws, Inyo County, *K. Brandegee*, May, 1913 (B). Owens Valley, Inyo County, *S. W. Austin* 457 (B).

62. Allocarya nitens Greene, Pittonia **3:** 108. 1896.

TYPE LOCALITY: Pine Valley, Nevada. Type collected by E. L. Greene, July 20, 1896.

SPECIMENS EXAMINED:

NEVADA: Pine Valley, *Greene*, July 20, 1896 (E). Palisade, *Greene*, August 24, 1896 (E).

UTAH: Johnson, *Jones* 5288, May 23, 1894 (N). "Southern Utah, Northern Arizona, etc.," *Palmer* 357½, in part, in 1877 (N).

63. Allocarya salsa T. S. Brandeg. Bot. Gaz. **27:** 452. 1899.

TYPE LOCALITY: "Alkaline soil, Twin Springs, Nevada, *Dr. C. A. Purpus*, no. 6339, August, 1898."

SPECIMENS EXAMINED:

NEVADA: Twin Springs, *Purpus* 6339 (N, B).

64. Allocarya jucunda Piper, Bull. Torrey Club **29:** 643. 1902.

Allocarya cusickii jucunda Nels. & Macbr. Bot. Gaz. **61:** 36. 1916.

TYPE LOCALITY: "Christmas Lake, Oregon." Type, in the Gray Herbarium, collected by W. C. Cusick (no. 2723).

SPECIMENS EXAMINED:

OREGON: Christmas Lake, *Cusick* 2723, August 5, 1901 (G, E, N, B).

NEVADA: Carson City, *Jones*, June 2, 1897, in part (N).

Cusick's no. 2724, also from Christmas Lake, is *A. cusickii* Greene, but it is unusually strigillose.

65. Allocarya cusickii Greene, Pittonia **1:** 17. 1887.

TYPE LOCALITY: "Union County, Oregon, 1883, *W. C. Cusick*; also at Reno, Nevada. 1884, *Mrs. Curran*." No specimens of the Cusick collection have been examined.

SPECIMENS EXAMINED:

WASHINGTON: Crab Creek, *Suksdorf* 403, June 10, 1884 (G). Tshimikaïne (Chamokane), *Geyer* 548, in part (G).

OREGON: Christmas Lake, *Cusick* 2724 (G, N, E). Eastern Oregon, *Cusick* 1754, in part (S).

NEVADA: Eagle Valley, Ormsby County, *C. F. Baker* 1266, July 7, 1902 (G, N). Reno, *Curran*, in 1884 (G, E). Deeth, *Heller* 9019, July 17, 1908 (G, S); *Greene*, July 5, 1896 (E). Carson City, *Anderson*, in 1865 (G); *Jones*, June 2, 1897, in part (N). Humboldt Wells, *Greene*, July 25, 1893 (E). Palisade, *Greene*, July 12, 1893 (E). Holborn, *Greene*, July 16, 1896 (E). Soda Springs, *Shockley* 322 (E). Elko, *Kennedy* 4495 (S).

UTAH: St. Thomas, *Goodding* 697, May 5, 1902 (G).

CALIFORNIA: Susanville, *McKee & Westover*, June 13, 1918 (G).

66. Allocarya inornata Piper, sp. nov.

Annual, erect, branched from the base, 15 to 30 cm. high; stems slender, nearly glabrous, very sparsely strigillose; leaves lance-linear, acutish 2 to 4 cm. long, nearly glabrous, with a few strigillose hairs beneath; racemes rather loose in fruit, the internodes 2 to 4 times as long as the calyces, a few of the lower flowers bracteate; pedicels shorter than the calyces; calyx not accrescent, the lobes lance-oblong, obtusish, sparsely strigillose beneath, 2 mm. long; corolla minute, barely exceeding the calyx; nutlets ovoid, dull, 1.2 mm. long, the dorsum keeled near the apex, reticulately rugulose, not at all granulate, the venter keeled and reticulately rugulose; scar linear, one-third as long as the nutlet.

Type in the U. S. National Herbarium, no. 444293, collected at Ramona, San Diego County, California, May 23, 1903, by T. S. Brandegee (Baker, no. 3380). A specimen of the same collection is in the Gray Herbarium.

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: Goshen, Tulare County, *Eastwood* 2918, March 26, 1914 (C). San Diego, *Abrams* 3451, May 10, 1903 (S).

67. Allocarya media Piper, sp. nov.

Annual, branched from the base, the branches ascending to erect, 15 to 30 cm. long; stems rather slender, strigillose; leaves linear, mostly obtuse, sparsely strigillose on both sides, 2 to 6 cm. long; racemes subsecund, rather loose in fruit, the internodes 2 to 4 times as long as the calyces, the lower flowers leafy-bracted; pedicels shorter than the calyces; calyx strigillose, ferruginous when young, scarcely accrescent, the lanceolate acute lobes 3 to 4 mm. long in fruit; corolla 4 to 5 mm broad; nutlets ovoid, 1.5 mm. long, the dorsum convex, keeled toward the apex, sparsely rugulose with low entire ridges but toward the base low-tuberculate, not at all granulate, the venter keeled its whole length and reticulate-rugulose; scar ovate, suprabasal; surface of nutlet, except the ridges, dull, but epidermal cells nearly all smooth.

Type in the U. S. National Herbarium, no. 620527, collected at Port Angeles, Washington, June 26, 1908, by J. B. Flett (no. 3378).

ADDITIONAL SPECIMENS EXAMINED:

WASHINGTON: Clallam County, *Elmer* 2755, June, 1900 (N, S). Cowichan Lake, *Rosendahl* 1759, June 13, 1907 (G, N). Friday Harbor, *Zeller* 856, in 1917 (G). Whidby Island, *N. L. Gardner* (B).

BRITISH COLUMBIA: Vancouver Island, *Lyall*, in 1858 (G); *Macoun* 56, May 16, 1887 (G). Esquimalt, *Anderson* 503, May 20, 1916; *Macoun* 78643, May 23, 1908 (B). Cedar Hill, *Macoun*, May 11, 1887 (G), very young and therefore doubtful, but certainly not *A. chorisiana*, as labeled. Victoria, *Fletcher*, May, 1885 (G); *Macoun* 680, May 22, 1893 (G); *A. J. Pineo*, June 21, 1899 (B); *Macoun* 78645, April 23, 1908 (B); *Macoun* 78646, April 29, 1908 (B); *Macoun* 78650, April 29, 1908 (B). Oak Bay, *Macoun* 78644, May 14, 1908 (B).

68. Allocarya divaricata Piper, sp. nov.

Annual, branched from the base, the stout, straight, strigillose, mostly simple branches widely spreading, 10 to 30 cm. long; leaves linear to oblanceolate, obtuse, nearly glabrous above, setulose beneath and ciliate, 1 to 4 cm. long; racemes loose in ruit, the internodes about 4 times as long as the calyces, most of the lower flowers leafy-bracted; pedicels shorter than the calyces; calyx not accrescent, the lanceolate acute lobes little spreading, strigillose, about 3 mm. long; corolla small, barely exceeding the calyx; nutlets ovoid, glossy, 1.5 mm. long, the dorsum keeled about half its length, transversely rugulose with low obtuse ridges, the rather large interspaces not at all or very obscurely granulate, the venter keeled and obliquely rugulose; scar suprabasal, ovate, small.

Type in the U. S. National Herbarium, no. 529836, collected on exposed rocks on the seashore, Victoria, British Columbia, June 6, 1905, by William Palmer.

69. Allocarya cognata Greene, Pittonia **4:** 235. 1901.

TYPE LOCALITY: "Cache Valley, Utah." Type, in the Greene Herbarium, collected by Miss Isabel Mulford, June 17, 1898.

SPECIMENS EXAMINED:

UTAH: Cache Valley, *Mulford*, June 17, 1898 (E). Clayton Peak, Wasatch Mountains, *Stokes*, August, 1903 (N). Big Cottonwood Canyon, Salt Lake County, *Garrett*, August, 1904 (G).

WYOMING: Evanston, *Williams*, July 10, 1897 (N). Centennial, *Nelson* 8691 (N, G).

COLORADO: San Luis Valley, *Wolf* 704, in 1873 (N). Empire, *Patterson* 288, in part, in 1892 (G).

NEVADA: Reno, *Purpus*, in 1898 (B); *Hitchcock* 441, July 17, 1913 (N). Carson City, *Anderson* 197, in 1865 (G).

CALIFORNIA: Camp Agassiz, Glen Alpine region, *Eastwood*, in 1906 (C). Goose Valley, Shasta County, *Eastwood* 748, in 1912 (C). Loyalton, *Eastwood* 7850, June 29, 1918 (C).

The limits of this species are not clear. Some specimens approach *A. californica* very closely, the crucial difference relied upon being the smooth epidermal cells of the nutlets.

70. Allocarya trachycarpa (A. Gray) Greene, Pittonia 1: 14. 1887.

Krynitzkia trachycarpa A. Gray, Proc. Amer. Acad. **20:** 266. 1885.

TYPE LOCALITY: "California, in Sonoma County, *Brewer*, and San Joaquin Valley, *Greene*." Types in the Gray Herbarium.

SPECIMENS EXAMINED:

CALIFORNIA: Sonoma County, *Brewer* 1007 (G, N, B); this number in the University of California Herbarium is another species, probably *A. conjuncta*. San Joaquin Valley, *Greene*, April 21, 1884 (G); *Greene*, April, 1881 (E). Livermore, *Bioletti*, April, 1892 (G). Byron Springs, *Eastwood* 3808, in part, March 14, 1892 (G, N); *Greene*, March 28, 1888 (B). Byron, *Greene*, March, 1889 (E). Anderson, *W. W. Jones* 264a, May 9, 1911 (G). Near Antioch, *Curran*, May 9, 1886 (C); *K. Brandegee*, May, 1892 (B); *Greene*, April 7, 1895 (E). King City, *Eastwood* 4074, April 2, 1915 (C). Tracy, *K. Brandegee*, April, 1889 (B). French Camp, San Joaquin County, *Sanford* 100, in part (B). Carmel Mission, *Abrams* 6414, April 2, 1917 (S). San Juan grade, Monterey County, *Abrams* 5649, June 1, 1916 (S).

71. Allocarya interrasilis Piper, sp. nov.

Annual, much branched from the base, 20 to 30 cm. high; branches slender, erect or ascending, sparsely strigillose; leaves linear to narrowly oblanceolate, acute, nearly glabrous above, strigillose beneath, 1 to 4 cm. long; racemes with many leafy bracts, the internodes 4 to 8 times as long as the fruiting calyces; pedicels all shorter than the calyces; calyx not accrescent, the lance-oblong lobes spreading, acute, strigillose, 3 to 4 mm. long in fruit; corolla small, 2 mm. broad; nutlets angularly ovoid, short-acute, 1.8 mm. long, the dorsum faintly keeled nearly its whole length, transversely crenulate-rugulose, the rather large interspaces densely and coarsely granulate, the edges angled, the venter reticulate-rugulose, keeled from scar to apex; scar suprabasal, broadly triangular-ovate, flange-margined, one-fourth as long as the nutlet.

Type in the herbarium of the University of California, no. 24554, collected at Hollister, California, April 14, 1897, by W. A. Setchell.

ADDITIONAL SPECIMEN EXAMINED:

CALIFORNIA: San Luis Obispo, *Condit*, April 25, 1912 (B).

Very close to *A. trachycarpa* (A. Gray) Greene, but the sculpturing of the nutlets is different.

72. Allocarya plebeja (Cham.) Greene, Pittonia **1:** 16. 1887.

Lithospermum plebejum Cham. Linnaea 4: 446. 1829.

Eritrichium plebeium A. DC. in DC. Prodr. **10:** 133. 1846.

Krynitzkia plebeja A. Gray, Proc. Amer. Acad. **20:** 266. 1885.

TYPE LOCALITY: Unalaska.

SPECIMENS EXAMINED:

ALASKA: Unalaska, *Mertens* (G); *Chamisso* (G; type collection?); *Harrington*, October 14, 1870 (G); *Harrington*, in 1871–72 (N); *Evermann* 125, August 2, 1892 (N); *Coville & Kearney* 1706, July 8, 1899 (N). Unga Island, *Harrington*, July 16, 1872 (G). Kodiak, *Coville & Kearney* 2390, July 20, 1899 (N); *Evans* 349, July 13, 1897 (N).

73. Allocarya insculpta Piper, sp. nov.

Annual, branched from the base, the branches, 5 to 12 cm. long; stems slender, sparsely strigillose; leaves linear, acutish, glabrous above, sparsely pustulate-strigillose beneath, 1 to 3 cm. long; racemes loose in fruit, the internodes becoming 4 to 6 times as long as the calyces, the lower flowers leafy-bracteate; pedicels shorter than the calyces; calyx erect, 2 to 3 mm. long, the lobes oblong-lanceolate, obtusish, glabrous above, strigillose beneath, not accrescent; corolla very small, barely exceeding the calyx; nutlets ovoid, 1.5 mm. long, the dorsum obtusely keeled for about half its length, transversely rugulose with broad low broken glossy ridges, sparingly tuberculate, especially toward the base, the venter keeled its whole length and reticulately rugulose; scar nearly basal, ovate; epidermis of nutlet rather glossy but under the microscope finely muriculate, especially on the angles.

Type in the U. S. National Herbarium, no. 525596, collected on borders of alkaline swales, Coulee City, Washington, June 1, 1902, by C. V. Piper (no. 3869).

74. Allocarya dispar Piper, sp. nov.

Annual, much branched from the base, the whole herbage densely strigillose; branches spreading, 8 to 15 cm. long; leaves linear, obtusish, glabrous above, pustulate-strigillose beneath, 1 to 3 cm. long; racemes bracted, rather loose in fruit, the internodes 2 to 3 times as long as the calyces; pedicels shorter than the calyces; calyx lobes lanceolate, acute, somewhat spreading in fruit, 3 mm. long, not accrescent; corolla very small, barely exceeding the calyx; nutlets broadly ovoid, barely acute, 1.4 mm. long, the dorsum convex, somewhat keeled toward the apex, transversely rugulose with a few low obtuse entire polished ridges, the interspaces dull and not at all granulate, the venter keeled its length, smooth or nearly so; scar ovate, nearly basal; epidermal cells finely muriculate under the microscope.

Type in the Gray Herbarium, collected in dry soil, Agness, Oregon, June 22, 1917, by J. C. Nelson (no. 1433).

ADDITIONAL SPECIMEN EXAMINED:

CALIFORNIA: Adams Station, *Eastwood* 203, in 1907 (C).

75. Allocarya granulata Piper, sp. nov.

Annual, branched from the base, the branches erect or nearly so, 15 to 30 cm. long; stems slender, strigillose; leaves linear to lance-linear, acutish, nearly glabrous above, pustulate-strigillose beneath, 2 to 5 cm. long; racemes rather closely flowered, the internodes mostly twice as long as the fruiting calyces, a few of the lower flowers bracteate; pedicels shorter than the calyces; calyx not accrescent, 2 to 3 mm. long, the lobes slightly spreading, lanceolate, obtuse, strigillose, ferruginous at tip; corolla exceeding the calyx, about 2 mm. broad; nutlets narrowly ovoid, dull, 1.4 mm. long, the dorsum convex, keeled near the apex, transversely rugulose with 3 or 4 very narrow ridges, very densely granulate in the interspaces, the venter keeled its whole length, finely rugulose and densely granulate; scar minute, oval, nearly basal.

Type in the Gray Herbarium, collected at Salem, Oregon, June 14, 1917, by J. C. Nelson (no. 1338).

ADDITIONAL SPECIMENS EXAMINED:

OREGON: Orville, *Nelson* 1827, August 6, 1917 (G). Silverton, *Hall* 407, in 1871 (G, N). Yamhill County, *Summers*, May, 1880 (N). Lower Albina, *Sheldon* S10577, June 16, 1902 (N, G). Sauvies Island, *J. Howell*, May 12, 1886, and May, 1875.

WASHINGTON: Bingen, *Suksdorf* 2207, May 18, 1893 (N, B, G).

76. Allocarya conjuncta Piper, sp. nov.

Annual, branched from the base, the branches mostly simple, ascending to erect, 15 to 30 cm. high; stems slender, sparsely strigillose; leaves linear, acute or obtuse,

sparsely strigillose beneath, glabrous or nearly so above, 2 to 8 cm. long; racemes slender, at length very loose, the lower internodes 4 to 6 times as long as the calyces, a few of the lower flowers bracteate; pedicels shorter than the calyces; calyx not accrescent, the lanceolate acutish strigillose lobes erect or somewhat spreading, 2 to 3 mm. long; corolla exceeding the calyx, about 2 mm. broad; nutlets ovoid, 1.2 to 1.4 mm. long, the dorsum somewhat keeled for all or much of its length, conspicuously transverse-rugulose, granulate in the interspaces, the venter keeled its whole length and obliquely rugulose; scar ovate, small, nearly basal.

Type in the U. S. National Herbarium, no. 440896, collected at Chico, California, May 15, 1903, by E. B. Copeland (no. 3046). Specimens of the same collection are in the Gray Herbarium and the herbarium of the University of California.

ADDITIONAL SPECIMENS EXAMINED:

CALIFORNIA: Chico, *Palmer* 2088, in part, June, 1892 (N); *Greene*, June, 1890 (N). Rutherford, *Jepson*, April 26, 1893 (N). Sacramento, in 1870, collector unknown (N). Oakland, *Holder* 2527 (N). Livermore, *Heller* 7321, April 14, 1904 (N, G, B). Near Napa, *Heller & Brown* 5361, April 25, 1902 (N, G, S). Stanford University, *C. F. Baker* 401, March 27, 1902 (N, G); *Elmer* 4492, April, 1903 (N, S); *Abrams* 2352, April 20, 1902 (S); *Dudley*, April 29, 1902 (S); *Dudley*, May 9, 1906 (S); *Meta D. Dannell*, April 24, 1915 (S). Palo Alto, *Crosbie* 376, April 23, 1905 (N). Vinton to Beckwith, *Heller & Kennedy* 8680, in part (N, G, S, B). Boggs Lake, Lake County, *K. Brandegee*, June 30, 1911 (B). Petaluma, *Palmer* (B). Vanden, *K. Brandegee*, April 30, 1893 (B). Alma, *Brandegee*, April 22, 1890 (B). Middletown, *K. Brandegee*, May, 1890 (B). Capay Valley, *Blankinship*, April 15, 1893 (B). Antioch, *K. Brandegee*, May, 1884 (B). Goose Valley, *Baker & Nutting*, May 26, 1894 (B). Waverly, *Sanford*, in 1890–91 (B). Mount Eden, *K. Brandegee*, May 22, 1893 (B); *K. Brandegee*, April 27, 1890 (B); *T. S. Brandegee*, May 14, 1893 (B). Rose Springs, *M. H. Gates*, in 1879 (B). Near Folsom, *Heller* 12306, April 7, 1916 (S). Butte County, *Austin*, April, 1896 (B). Little Oak, *Jepson*, May 2 to 6, 1891 (B). Lancha Plana, *Hansen* 1274, April 19, 1895 (N). New York Falls, *Hansen* 429, May 3, 1894 (N). Camanche, *Hansen* 1274, April, 1895 (S). Amador, *Hansen* 427, May, 1893 (S). Plymouth, *Gross* 162, June 6, 1903 (S). Mariposa, *Congdon* 47, May 16, 1897 (G); *Congdon* 228, May 1, 1889 (B). Agua Fria, *Congdon* 99.49 (G). Eight miles north of Oroville, *Heller* 11308, April 17, 1914 (G, B, S). Eight miles north of Orland, *Heller* 11838, April 16, 1915 (G, S). Campbell, *Heller* 8512, May 7, 1907 (N, G, S). Anderson, *W. W. Jones* 264, May 9, 1911 (G); *L. E. Smith*, May, 1915 (C). St. Helena, *Jepson*, May 2, 1897 (G).

OREGON: Near Wimer, Jackson County, *Hammond* 292, June 7, 1892 (N).

LOWER CALIFORNIA: Northern Lower California, *Orcutt* 2259, April 6, 1886 (B).

Of the California specimens above listed *Heller & Brown* 5361, *Heller* 12306, and the plant collected by Jepson are referred doubtfully to this species.

77. Allocarya corrugata Piper, sp. nov.

Annual, sparingly branched from the base, the branches erect, 10 cm. high; stems slender but apparently somewhat fleshy, sparsely strigillose; leaves narrowly linear, sparsely pustulate-strigillose, 2 to 4 cm. long; racemes loose in fruit, the internodes 4 to 6 times as long as the calyces, the lower flowers bracteate; pedicels shorter than the calyces; calyx not accrescent, 2 mm. long, the lobes erect, lanceolate, acute, sparsely strigillose; corolla exceeding the calyx, 1.5 mm. broad; nutlets ovoid, 1.3 mm. long, the dorsum keeled near the apex, transversely rugulose with shiny, rather even ridges, sparsely tuberculate near the base, not at all granulate, the venter keeled its whole length, reticulately rugulose; scar suprabasal, narrow, one-fourth as long as the nutlet; epidermis of nutlet very finely muriculate.

Type in the U. S. National Herbarium, no. 880533, collected at Guernsey, Tulare County, California, March 25, 1914, by Miss Alice Eastwood (no. 3895). Specimens of the same collection are in the Gray Herbarium and in the herbarium of the California Academy of Sciences.

78. Allocarya scalpocarpa Piper, sp. nov.

Annual, branched from the base, the branches ascending to erect, 10 to 12 cm. high; stems slender, strigillose; leaves linear, acute, finely strigillose above, pustulate-strigillose beneath, 1 to 3 cm. long; racemes rather loose in fruit, the internodes 3 to 4 times as long as the calyces, a few of the lower flowers bracteate; pedicels nearly as long as the calyces; calyx not accrescent, the lobes lance-oblong, acute, little spreading, strigillose, 2 mm. long, little exceeding the nutlets; corolla 3 mm. broad; nutlets ovoid, dull, 1.6 mm. long, the dorsum convex, obscurely keeled near the apex, prominently tuberculate or the tubercles obscurely united as ridges, densely granulate, the venter keeled, somewhat reticulately rugulose; scar lanceolate, in a conspicuous circular depression; epidermis of the nutlets strongly muriculate under the microscope.

Type in the herbarium of the California Academy of Sciences, collected at Burney, Shasta County, California, June 28, 1912, by Miss Alice Eastwood.

79. Allocarya californica (Fisch. & Mey.) Greene, Pittonia **1**: 20. 1887.

Myosotis californica Fisch. & Mey. Ind. Sem. Hort. Petrop. **2**: 42. 1835.

Eritrichium californicum A. DC. in DC. Prodr. **10**: 130. 1846.

Krynitzkia californica A. Gray, Proc. Amer. Acad. **20**: 266. 1885.

Allocarya scopulorum Greene, Pittonia 1: 16. 1887.

TYPE LOCALITY: "In Nova California circa coloniam Ross."

Apparently authentic specimens are in the National Herbarium from the St. Petersburg Botanical Garden, and in the Gray Herbarium from the botanical gardens at Leipzig and Cambridge. All of these are plants 30 to 45 cm. high; the leaves are rather thin and strigillose on both faces, the racemes are loose, and the scar is linear to panduriform and one-fourth to one-third as long as the nutlet. In recent gatherings these specimens are well matched by Miss Eastwood's nos. 55 and 4591, Heller's no. 5929, and Blaisdell's plant from Mokelumne Hill. There seems to be, however, in California every gradation from the above to low plants with densely flowered racemes and ovate scar to the nutlet, the latter form not being distinguishable from *A. scopulorum* Greene. Some of the dwarfer plants have linear scars, as in Sonne's specimen from Truckee.

Allocarya scopulorum was based on "*Eritrichium californicum* var. *subglochidiatum* Gray as to the plant of Colorado, Wyoming, and Montana." Greene's original description evidently includes forms with bristly and with glabrous nutlets, while the synonym quoted refers only to forms with bristly nutlets. This, as shown by the Rocky Mountain specimens marked by Dr. Gray, includes *A. nelsoni* Greene and *A. asperula* Piper. Nevertheless, in his own herbarium Dr. Greene consistently used the name *A. scopulorum* for the very common plant of the Rocky Mountains with glabrous nutlets. In the Greene Herbarium no sheet is labeled type, but there is only one specimen collected previous to 1887, namely, "Denver, Colo., *Greene*, in 1870." In the herbarium of the California Academy of Sciences, Tweedy's no. 817, from Yellowstone Lake, collected in July, 1885, is labeled "type," but apparently not by Dr. Greene himself. Both specimens represent the common Rocky Mountain plant which has very consistently been recognized as *A. scopulorum* Greene. For the reasons indicated above it has seemed necessary to reduce *A. scopulorum* to synonomy.

SPECIMENS EXAMINED:

CALIFORNIA: Avery, *Eggleston* 9175 (N). Upper Sacramento, *Parkinson* (N). Without locality, *Newberry* (N). Yreka, *Butler* 1424 (N, S). Mendocino, *Brown* 737 (N). Mount Sanhedrin, *Heller* 5929 (N, G). Donner Lake, *Heller*, July 8, 1903 (N, G); *Heller* 6891 (S; in other herbaria this number includes *A. hispidula* and *A. penicillata*). Donner, *K. Brandegee*, in 1888 (B). Truckee, *Heller* 7055a (N, S, in part). Truckee, *Sonne*, June 27, 1884 (G). Yosemite Valley, *Canby*, August, 1895 (N); *Abrams* 4613 (G). Hetch-Hetchy, *Congdon* 9935 (G); *Hall & Babcock* 3366, July, 1902 (B). Calaveras Big Tree Grove, *Dudley*, August 19, 1906 (S). Calistoga, *Eastwood*, May 8, 1900 (G); *Tracy* 1852, May, 1903 (B); *Tracy* 1843, May, 1903 (B). Cuyamaca Lake, *Abrams* 3845 (N, G, S); *K. Brandegee*, July 17, 1906 (B). Cuyamaca, *T. S. Brandegee*, June 5, 1896 (B). Modoc Ranch, *T. S. Brandegee* 1066 (B). Modoc County, *Austin* (B); *M. S. Baker* (B). Goose Lake, *Austin*, June, 1885 (B). Butte County, *Austin* (B). Prattville, *Cleveland*, July, 1882 (B). Little Hot Spring Valley, Modoc County, *Baker & Nutting*, June 4, 1894 (B). Sherwood Valley, *Blasdale* 1057, May 29, 1899 (B). Comptche, *Walker* 215, June, 1906 (B). Cazadero, *Congdon* 55 (G). Jolon, *Eastwood* 4132, in part (C). Petrified Forest, *Eastwood* 4591 (C). Kentfield, *Eastwood* 55 (C). Fallen Leaf Lake, *Eastwood*, in 1906 (C). Mount Diablo, *W. W. Carruth*, April 29, 1902 (C). Mokelumne Hill, *Blaisdell* (C). Blockman Ranch, Mariposa County, *Eastwood* 4279 (C).

WASHINGTON: Calispell Lake, *Kreager* 605 (N, G). Satus, *Cotton* 1134 (N). Without locality, *Vasey*, in 1885 (N); *Vasey* 424 (N, G); *Vasey* 423 (N, G). Whitman County, *Elmer*, in 1896 (N). Ellensburg, *Whited* 654 (G). Yakima Region, *Brandegee*, in 1882 (B).

IDAHO: Santianna Creek, *Leiberg* 1028 (G, N); *Leiberg* 1065a (G). Corral, Camas Prairie, *Macbride & Payson* 2922 (G). Big Potlatch River, *Sandberg, Heller & MacDougal* 365 (G). Falk's Store, Canyon County, *Macbride* 219 (G, S, B, N). Near Dixie, *Macbride & Payson* 2856 (G). Lewiston, *Heller* 3214 (N). Moscow, *Henderson*, June 16, 1894 (N). Lower Priest River, *Leiberg* 2892 (N). St. Anthony, *Merrill & Wilcox* 815, in part (N, G). Pend Oreille, *Greene*, August 9, 1889 (B).

OREGON: Elk Creek, *Leiberg* 4171, in part (N). Shirk, *Leiberg* 2591 (N, G, B). Klamath Valley, *Cronkhite* 65 (N, B); *Cronkhite* 23 (N, B).

UTAH: Fish Lake, *Rydberg & Bessey* 7605 (N, G). Burrill Sink, *Jones* 5638f (N). Panguitch Lake, *Jones* 6015am (N). Clayton Peak, Wasatch Mountains, *Stokes*, August 12, 1903 (N). Farmington, *W. W. Jones* 266 (G). Humboldt Basin, *Gray*, in 1872 (G).

NEVADA: Lee, Elk County, *Heller* 9435 (G, S). Truckee Valley, *Watson*, July, 1867 (N). Franktown to Washoe, *Heller*, July 22, 1912 (S).

NEW MEXICO: Chama, *Standley* 6800 (N, G).

ARIZONA: Flagstaff, *Hitchcock*, August, 1915 (N). Without locality, *Palmer* (N).

COLORADO: Denver, *Greene*, June 15, 1870 (E). Grizzly Creek, *Goodding* 1866, August 12, 1903 (N). Routt County, *Crandall* 354 (N). Gunnison County, *Cowen*, August 9, 1892 (N). Gunnison, *Baker* 938, August 27, 1901 (N, G). Buffalo Pass, *Shear* 3920, August 14, 1898 (N). Middle Park, *Parry*, in 1864 (N).[1] Georgetown, *Shear*, August 19, 1895 (N). Cerro Summit, *Baker* 152, June 17, 1901 (N, B, G). South Park, *Wolf* 691 (N). Camp Creek, Larimer County, *Goodding* 1469 (G). Del Norte, *Brandegee*, in 1875 (B). Tab-

[1] Determination doubtful.

eguache Basin, *Payson* 573 (G). Allanspark, *Johnston & Hedgcock* 519 (G); *Johnston & Hedgcock* 517 (G). Longs Peak Inn, *Johnston & Hedgcock* 518 (G).

WYOMING: Little Laramie River, *E. Nelson* 3451, July 24, 1897 (B). Teton Forest. *Brandegee*, in 1897 (N, B.) Crazy Mountain, *Williams*, July 31, 1898 (N). Bighorn Mountains, *Williams*, July 30, 1898 (N). Glenrock, *Nelson* 8379 (N, G). Doyle Creek, Bighorn County, *Goodding* 360 (N, B, G). Norris, *Nelson* 6136 (N, G). Dubois, *Nelson* 768 (N, B, G). Evanston, *Williams*, July 10, 1897 (N). Yellowstone Lake, *Tweedy* 817, August, 1885 (N, G); marked "type" in the herbarium of the California Academy of Sciences. Yellowstone Lake, *Burglehaus*, September, 1893 (N); *Rydberg & Bessey* 4881 (N, G). Yellowstone Park, *Mearns* 1841 (N). Camp Crawford, *Clemens*, August 6, 1908 (G, S). Centennial Valley, *Nelson* 1855, August 25, 1895 (B).

MONTANA: Wreck Creek, Sweet Grass County, *Eggleston* 7987 (N). Bozeman, *Blankinship* 371 (N). Cedar Mountain, *Rydberg & Bessey* 4880 (N, G.)

NORTH DAKOTA: Devils Lake, *Geyer*, August 1, 1839 (N).

YUKON: Dawson, introduced, *Macoun* 78738, July 15, 1902 (B).

DOUBTFUL SPECIES.

ALLOCARYA SUBGLOCHIDIATA (A. Gray) Piper, Contr. U. S. Nat. Herb. **11:** 485. 1906.

Eritrichium californicum subglochidiatum A. Gray in Brewer & Wats. Bot. Calif. **1:** 526. 1876.

Krynitzkia californica subglochidiata A. Gray, Proc. Amer. Acad. **20:** 266. 1885.

TYPE LOCALITY: "Placer to Sierra Co. (*Kellogg, Lemmon*), Nevada (*Watson*), etc."

The following specimens in the Gray Herbarium were before Dr. Gray in 1876, and were marked by him "*subglochidiatum*—Syn. Fl. N. A."

Battle Mountains, Nevada, *Watson* 851, June, 1868. Very young.

Truckee Valley, Nevada, *Watson* 851, May, 1868. Very young.

Carson City, Nevada, *Watson* 851, April, 1868. Very young.

Clover Mountains, Nevada, *Watson* 851, September, 1868. *A. asperula* Piper.

Fort Bridger, Wyoming, *Porter*, July 11, 1873. *A. asperula* Piper.

Uinta Mountains, Utah, *Porter*, July 28, 1873. *A. californica*? Too young for certain identification.

Kellogg & Harford 722. Nutlets only; *A. asperula* Piper?

Rocky Mountains, latitude 39°–41°, *Hall & Harbour* 433, in part. *A. nelsoni* Greene.

Rocky Mountains, *Hall*, grown from seed. *A. nelsoni* Greene.

The "Placer to Sierra Co. (*Kellogg, Lemmon*)" specimens have not been found. Upon the establishment of their identity or identities will depend the application of the name *subglochidiata*.

ALLOCARYA BRACTEATA Howell, Fl. Northw. Amer. 481. 1901.

There is no specimen in the Howell Herbarium marked *A. bracteata*, the type of which was collected "in wet places, Umpqua Valley, Oregon," nor have any been seen elsewhere. From the description alone it is very difficult to say what the plant may be.

ALLOCARYA HENDERSONI A. Nels. Erythea **7:** 69. 1899.

For the examination of the type specimens thanks are due to Dr. Aven Nelson. The specimens cited in the original description are all immature, but all represent the northwestern species of *Cryptantha* which has commonly been referred to *C. muriculata* (Hook. & Arn.) Greene, but which is different from that California species and much nearer to *C. ambigua* (A. Gray) Greene.

INDEX.

[Synonyms in italic. Page numbers of principal entries in heavy-face type.]

Page.

Allocarya 79
acanthocarpa **87**
ambigens **96**
anaglyptica **90**
areolata **105**
asperula **93**,111
austinae **89**
bracteata 93, **113**
californica **111**
calycosa **101**
cervina **100**
charaxata **96**
chorisiana **103**
cognata **107**
conjuncta **109**
cooperi **105**
corrugata **110**
cristata **89**
cryocarpa **98**
cusickii **106**
jucunda 106
diffusa **105**
dispar **109**
distantiflora **91**
divaricata **107**
divergens **92**,98
eastwoodae **89**
echinacea **88**
echinoglochin **89**
figurata **101**
glabra **95**
glyptocarpa **90**
gracilis **98**
granulata **109**
greenei 79, 87, 88, **89**
hendersoni 113
hickmanii **103**
hirta **101**
hispidula **99**
humistrata 92, **97**
hystricula **87**
inornata **106**
insculpta **109**
interrasilis **108**
jucunda **106**
laxa **98**
leibergii **95**
leptoclada **92**,93
limicola **97**
linifolia **79**
lithocarya 79, **102**
lonchocarpa 79, **97**
media **107**
mexicana 79
microcarpa **91**
minuta **104**
mollis **86**
vestita 87
myriantha **103**
nelsoni **92**,111
nitens **106**

Page.

Allocarya oligochaeta **88**
oricola **92**
orthocarpa **96**
papillata **91**
penicillata **99**
plebeja **108**
pratensis **99**
ramosa **100**
reticulata **105**
salina 95
salsa **106**
scalpocarpa **111**
scalpta **104**
scopulorum 79, 111
scouleri **102**
scripta **97**
setulosa **93**
sigillata **97**
spiculifera **90**
stipitata **94**
micrantha **94**,95
stricta **104**
subglochidiata **113**
tenera **99**
trachycarpa **108**
tuberculata **95**
undulata **104**
vallata **101**
vestita **87**
wilcoxii **93**
Cryptantha 113
ambigua 113
muriculata 113
Echinoglochin (section of Echinospermum) .. 79
Echinospermum 79
greenei 89
Eritrichium 79
californicum 111
subglochidiatum 111, 113
chorisianum 103
connatifolium 103
cooperi 105
plebeium 108
scouleri 102
Krynitzkia 79
californica 111
subglochidiata 93, 113
chorisiana 103
cooperi 105
lithocarya 102
mollis 86
plebeja 108
scouleri 102
trachycarpa 108
Lithospermum *glabrum* 95
plebejum 108
Myosotidea (section of Eritrichium) 79
Myosotis *californica* 111
chorisiana 103
scouleri 102

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

CONTRIBUTIONS

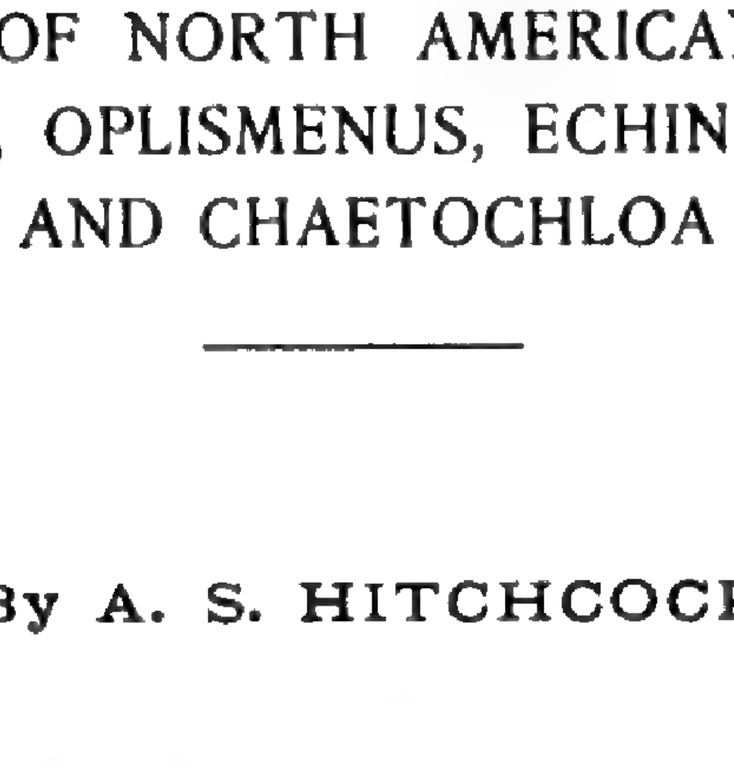
FROM THE

UNITED STATES NATIONAL HERBARIUM

VOLUME 22, PART 3

REVISIONS OF NORTH AMERICAN GRASSES: ISACHNE, OPLISMENUS, ECHINOCHLOA, AND CHAETOCHLOA

By A. S. HITCHCOCK



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II

PREFACE.

The four accompanying papers by Prof. A. S. Hitchcock, systematic agrostologist of the United States Department of Agriculture, consist of revisions of four genera of the tribe Paniceae, a continuation of his studies of North American grasses.

The first two genera, *Isachne* and *Oplismenus*, are chiefly tropical, although one species of *Oplismenus* extends into the southern United States. The other two genera are widely distributed in tropical and temperate regions. The genus *Echinochloa* includes the cosmopolitan weed *E. crusgalli*, one form of which is cultivated in India for food and occasionally in the United States for forage. The genus *Chaetochloa* includes the common millet, of which there are many varieties, cultivated in the Old World as a grain and in the United States for forage.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

CONTENTS.

Page.

THE NORTH AMERICAN SPECIES OF ISACHNE 115
Introduction 115
Description of the genus and species 115
THE NORTH AMERICAN SPECIES OF OPLISMENUS 123
Introduction 123
Description of the genus and species 123
Doubtful species 132
THE NORTH AMERICAN SPECIES OF ECHINOCHLOA 133
Introduction 133
Description of the genus and species 133
Doubtful species 153
THE NORTH AMERICAN SPECIES OF CHAETOCHLOA 155
Introduction 155
Description of the genus and species 156
Doubtful species 208
INDEX IX

ILLUSTRATIONS.

PLATES.

Following page.

PLATE 25. *Isachne polygonoides* (Lam.) Doell 122
26. *Isachne leersioides* Griseb 122
27. *Isachne pygmaea* Griseb 122
28. *Isachne rigidifolia* (Poir.) Urban 122
29. *Isachne rigens* (Swartz) Trin 122
30. *Isachne angustifolia* Nash 122
31. *Isachne arundinacea* (Swartz) Griseb 122
32. *Isachne disperma* (Lam.) Doell 122

TEXT FIGURES.

Page.

FIGURE 21. *Oplismenus burmanni* 125
22. *Oplismenus setarius* 128
23. *Oplismenus hirtellus* 130
24. *Oplismenus variflorus* 132
25. *Echinochloa pyramidalis* 134
26. *Echinochloa polystachya* 135
27. *Echinochloa oplismenoides* 136
28. *Echinochloa holciformis* 137
29. *Echinochloa walteri* 138
30. *Echinochloa crusgalli* 141
31. *Echinochloa crusgalli mitis* 145
32. *Echinochloa crusgalli edulis* 146
33. *Echinochloa crusgalli zelayensis* 147
34. *Echinochloa crusgalli crus-pavonis* 149
35. *Echinochloa colonum* 151
36. *Chaetochloa barbata* 159
37. *Chaetochloa poiretiana* 160
38. *Chaetochloa palmifolia* 162
39. *Chaetochloa sulcata* 164
40. *Chaetochloa lutescens* 167
41. *Chaetochloa geniculata* 172
42. *Chaetochloa tenax* 177
43. *Chaetochloa verticillata* 179
44. *Chaetochloa scandens* 181
45. *Chaetochloa tenacissima* 182
46. *Chaetochloa grisebachii* 184
47. *Chaetochloa magna* 185
48. *Chaetochloa viridis* 187
49. *Chaetochloa italica* 190
50. *Chaetochloa longipila* 191
51. *Chaetochloa corrugata* 192
52. *Chaetochloa liebmanni* 193

		Page.
FIGURE 53.	*Chaetochloa latifolia*	195
54.	*Chaetochloa macrosperma*	196
55.	*Chaetochloa villosissima*	197
56.	*Chaetochloa setosa*	199
57.	*Chaetochloa setosa*	199
58.	*Chaetochloa rariflora*	201
59	*Chaetochloa vulpiseta*	202
60.	*Chaetochloa macrostachya*	204
61.	*Chaetochloa macrostachya*	205
62.	*Chaetochloa scheelei*	208

THE NORTH AMERICAN SPECIES OF ISACHNE.

By A. S. Hitchcock.

INTRODUCTION.

This tropical genus of grasses is, in technical characters, anomalous in the tribe Paniceae, to which it belongs, in that the spikelet has two fertile florets instead of one. That is, throughout the tribe, with the exception of *Isachne*, the spikelet has one terminal fertile floret and one sterile floret, this consisting of a lemma only, of a lemma and palea, or of a lemma, palea, and a staminate flower. In *Isachne* the lateral floret contains a perfect flower and normally develops a seed.

There are seven species in North America, a few more in South America, and several in the tropics of the Old World.

DESCRIPTION OF THE GENUS AND SPECIES.

ISACHNE R. Br.

Isachne R. Br. Prodr. Fl. Nov. Holl. 196. 1810. A single Australian species, *I. australis*, is described.

DESCRIPTION.

Perennial or rarely annual grasses with simple or usually branching stems, flat, strongly nerved blades, and paniculate inflorescence. Spikelets obovoid to subglobose. Glumes membranaceous, about equal and as long as the fruits or at maturity exceeded by them. Lower floret perfect or staminate, its lemma and palea indurate and similar in form and texture to those of the upper floret. Both florets (or fruits) plano-convex, obtuse, equal in size or the upper shorter, the pair usually remaining attached by the minute rachilla joint between them.[1]

Isachne polygonoides is exceptional in that the lower floret is unlike the upper. In all the species the lower floret of some of the spikelets may fail to perfect a grain. When sterile the floret is often longer and the lemma less convex than when fertile, the spikelets on the same panicle thus having a somewhat diverse appearance.

KEY TO THE SPECIES.

Florets appressed-pubescent.

Blades ovate-clasping.....1. **I. polygonoides.**

Blades linear.....2. **I. leersioides.**

[1] For further discussion see Chase, Genera Paniceae. IV. Proc. Biol. Soc. Washington **24:** 149. 1911.

Florets glabrous, or the palea minutely hispidulous.
Panicle contracted, spikelike, not over 3 cm. long, the branches appressed or the lower sometimes ascending; plants low and spreading.....**3. I. pygmaea.**
Panicles open, the branches spreading or ascending.
Blades about 3 mm. wide, thick, rigid, pungent, with conspicuously thickened midrib.....**4. I. rigidifolia.**
Blades mostly 5 to 20 mm. wide, firm but not pungent nor with thickened midrib.
Plants trailing; blades rarely over 5 cm. long.....**5. I. rigens.**
Plants clambering; blades mostly more than 5 cm. long.
Glumes pubescent; blades firm, not over 12 cm. long and 1 cm. wide.
6. I. angustifolia.
Glumes glabrous (rarely obscurely pubescent at the tips); blades mostly over 15 cm. long and 1.5 cm. wide.
Spikelets aggregate toward the ends of the branches and branchlets.
7. I. arundinacea.
Spikelets not aggregate; panicle loosely flowered.....**8. I. disperma.**

1. **Isachne polygonoides** (Lam.) Doell.

Panicum polygonoides Lam. Encycl. **4**: 742. 1798. "Cette plante croît à Cayenne, & m'a été communiquée par le citoyen Leblond." The type, in the Paris Herbarium, is an entire plant.

Panicum trachyspermum Nees, Agrost. Bras. 212. 1829. "Habitat in graminosis prope Pará provinciae Paraensis." The type, collected by Martius, has been examined in the Munich Herbarium.

Isachne trachysperma Nees in Seem. Bot. Voy. Herald 224. 1857. Based on *Panicum trachyspermum* Nees.

Isachne polygonoides Doell in Mart. Fl. Bras. **2**^{2}: 273. 1877. Based on *Panicum polygonoides* Lam.

DESCRIPTION.

Culms decumbent, branching and spreading, rooting at the lower nodes, the flowering branches ascending, 10 to 30 cm. tall, glabrous, the nodes glabrous but the base of the sheath hispid; sheaths mostly shorter than the internodes, papillose-hispid or glabrate; ligule a ring of stiff hairs about 2 mm. long; blades ovate or ovate-lanceolate, 2 to 5 cm. long, 7 to 17 mm. wide, cordate-clasping and ciliate at base, acute or somewhat acuminate at apex, scabrous on the upper surface, puberulent or pubescent beneath; panicles numerous, ovoid, partially inclosed in the sheaths or finally exserted, the branches and branchlets slender, spreading, stiff and more or less implicate, the pedicels 2 to 4 mm. long, enlarged at the summit; spikelets about 1.5 mm. long; first glume glabrous; second glume sparsely hispidulous; lower floret ovate, only slightly turgid, greenish, glabrous, cartilaginous rather than indurate, exceptional for the genus in resembling the glumes rather than the upper floret; upper floret pubescent, whitish, indurate, hemispherical.

This species appears to be an annual. It is distinguished from all our other species by the ovate clasping blades and by the dissimilarity of the two florets.

DISTRIBUTION.

Moist ground, often in the water, Guatemala to Brazil.

GUATEMALA: Chupadero, *Heyde & Lux* 3916.

COSTA RICA: Buenos Aires, *Tonduz* 4874. Boruca, *Tonduz* 4623. Turrialba, *Tonduz* 8233. San Ramón, *Tonduz* 17909.

PANAMA: Porto Bello, *Pittier* 2454. Dolega, *Hitchcock* 8333. Coclé, *Pittier* 4917. Chepo, *Pittier* 4531. Corozal, *Hitchcock* 9198. David, *Hitchcock* 8375. Gatún Lake, *Amer. Gr. Nat. Herb.* 599. Juan Diaz, *Killip* 4060.

TRINIDAD: Piarco Savanna, *Amer. Gr. Nat. Herb.* 598.

COLOMBIA: Corinto, *Pittier* 1005.
BRITISH GUIANA: Without locality, *Jenman* 5975.
FRENCH GUIANA: Without locality, *Leprieur* 69.
BRAZIL: Bahia, *Riedel* in 1831.

EXPLANATION OF PLATE 25.—*Isachne polygonoides*. Specimen from Panama, *Amer. Gr. Nat. Herb.* 599. Natural size.

2. Isachne leersioides Griseb.

Isachne leersioides Griseb. Mem. Amer. Acad. n. ser. 8: 533. 1862. This is in the second part of Plantae Wrightianae. The only specimen cited is Wright's no. 755. Grisebach's specimen of this number, which is the type, is without locality other than eastern Cuba. A specimen in the Gray Herbarium is labeled Monte Verde.

DESCRIPTION.

Culms slender, branched, trailing, glabrous, striate, 1 to 2 meters long; sheaths on the main culms much shorter than the elongate internodes, overlapping on the flowering branches, appressed papillose-hispid or nearly glabrous; ligule a very short membrane, ciliate with stiff hairs about 1 mm. long; blades linear, ascending, rather firm, 5 to 15 cm. long, 0.5 to 4 mm. wide, long-acuminate, cartilaginous-margined, scabrous or hispidulous on both surfaces; panicles terminating the branches, ovoid or oblong, 5 to 15 cm. long, as much as 7 cm. wide, the branches mostly single, rather stiffly ascending or spreading, bearing from near the base stiffly spreading branchlets, the spreading pedicels 2 to 3 mm. long; spikelets about 1 mm. long; glumes hispidulous; florets appressed-pubescent.

DISTRIBUTION.

Dry cliffs and pine barrens, Cuba.
CUBA: Sierra de las Yeguas, *Léon* 5078. Zaza del Sur, *Léon* 6730. Sierra del Caballete, *Léon* 6520. Cajálbana, *Léon* 4843. Woodfred, *Shafer* 3013. La Perla, *Shafer* 8561. Monte Verde, *Wright* 755.

EXPLANATION OF PLATE 26.—*Isachne leersioides*. Specimens from Cuba, *Léon* 4843 and 5078. Natural size.

3. Isachne pygmaea Griseb.

Isachne pygmaea Griseb. Fl. Brit. W. Ind. 553. 1864. "Hab. Jamaica!, Macf., probably an alpine grass, like the preceding [*I. rigens*]." The type, collected by Macfadyen but without exact locality, has been examined in the Grisebach Herbarium.

DESCRIPTION.

Plants low, the slender branches spreading, glabrous, the flowering shoots usually less than 15 cm. tall, rarely as much as 30 cm. long; sheaths glabrous, ciliate on the margins; ligule a very short hispidulous ring; blades narrowly oblong-lanceolate, 0.5 to 2 cm., or rarely 3 cm. long, rarely over 2 mm. wide, spreading, glabrous or puberulent, the white cartilaginous margin somewhat scabrous; panicles long-exserted, narrow, compact and spikelike, usually less than 2 cm. long, the lower branches short and somewhat distant, appressed or rarely ascending; spikelets about 1.3 mm. long, nearly sessile; glumes glabrous, about two-thirds as long as the spikelet; florets glabrous.

DISTRIBUTION.

Grassy banks. This rare grass has a very limited distribution, being known only from a small area in the Blue Mountains of Jamaica between Newcastle and Cinchona, at about 1,500 meters altitude.
JAMAICA: Cold Spring Gap, *Amer. Gr. Nat. Herb.* 419; *Harris* 11314, 12490. Moodys Gap, *Britton* 3375.

EXPLANATION OF PLATE 27.—*Isachne pygmaea*. Specimen from Jamaica, *Amer. Gr. Nat. Herb.* 419. Natural size.

4. Isachne rigidifolia (Poir.) Urban.

Agrostis rigidifolia Poir. in Lam. Encycl. Suppl. **1**: 257. 1810. "Cette plante croît à l'île de Saint-Domingue. (V. s. in herb. Desfont.)" Poiret gives as a synonym *Milium rigidum*. The type has been examined at the Florence Herbarium. It is now in the Webb Herbarium, which contains the Desfontaines Herbarium.

Milium rigidum Poir. in Lam. Encycl. Suppl. **1**: 257. 1810, as synonym of *Agrostis rigidifolia* Poir.

Milium rigidifolium Roem. & Schult. Syst. Veg. **2**: 319. 1817. Based on *Agrostis rigidifolia* Poir.

Panicum rigidifolium Kunth, Rév. Gram. **1**: 37. 1829. Based on *Agrostis rigidifolia* Poir.

Isachne rigidifolia Urban, Symb. Antill. **4**: 85. 1903. Based on *Agrostis rigidifolia* Poir. The specimen which Urban mentions, *Sintenis* 1359 from Sierra de Luquillo, Porto Rico, is *Isachne angustifolia*.

DESCRIPTION.

Culms spreading and branching, the flowering shoots firm and rigid, 15 to 40 cm. tall; sheaths glabrous, stiffly ciliate on the margin, overlapping on the flowering shoots; ligule a very short, lacerate or ciliate membrane; blades oblong, 2 to 4 cm. long, 2 to 4 mm. wide, firm, rigidly spreading, pungently pointed, glabrous, the cartilaginous margin and thick midrib whitish; panicles long-exserted, open, oblong, rather narrow, 2 to 5 cm. long, the branches ascending or spreading, bearing the branchlets mostly on the lower side, the pedicels rigid, 1 to 2 mm. long; spikelets about 2 mm. long, purplish, borne obliquely upon the pedicels; glumes glabrous or sparsely appressed-hispidulous near apex; florets smooth.

The species is easily recognized by its smooth, rigid, spreading, pungently pointed, conspicuously distichous blades.

DISTRIBUTION.

Mountain bogs, West Indies.

SANTO DOMINGO: Río Yaque, *Fuertes* 1729.

LEEWARD ISLANDS: Guadeloupe, *Duss* 3190.

WINDWARD ISLANDS: Martinique, *Duss* 1312; *Hahn* 1435.

EXPLANATION OF PLATE 28.—*Isachne rigidifolia*. Specimen from Martinique, *Hahn* 1435. Natural size.

5. Isachne rigens (Swartz) Trin.

Panicum rigens Swartz, Prodr. Veg. Ind. Occ. 23. 1788. "Jamaica." The type, in the Swartz Herbarium at Stockholm, is an ample specimen.

Isachne rigens Trin. Gram. Pan. 252. 1826. Based on *Panicum rigens* Swartz.

DESCRIPTION.

Culms tufted, glabrous, slender, wiry, trailing, 1 to 2 meters long, as much as 2 mm. thick, the numerous flowering shoots curving upward, 10 to 30 cm. long; sheaths glabrous or puberulent, ciliate on the margin; ligule a ring of stiff hairs about 0.5 mm. long; blades narrowly oblong-lanceolate, 2 to 5 cm. long, 2 to 5 mm. wide, spreading, moderately firm but not stiff and rigid, scabrous on both surfaces and on the cartilaginous margin; panicles ovoid or oblong, 2 to 5 cm. long, the branches and branchlets stiffly ascending or spreading, the pedicels 1 to 2 mm. long; spikelets 1.8 to 2 mm. long; glumes minutely hispidulous; rachilla between the two florets minutely villous; palea of upper floret sparsely appressed-hispidulous.

DISTRIBUTION.

Damp shady banks, Blue Mountains, Jamaica, at 1,000 to 2,000 meters altitude; also in northern South America.

JAMAICA: Cinchona, *Amer. Gr. Nat. Herb.* 420; *Harris* 11316, 11333, 11417, 11432, 12480. Abbey Green, *Hitchcock* 9362; *Harris* 11585. Catherines Peak, *Hitchcock* 9732. Clyde River, *Harris* 11445. Cold Spring Gap, *Harris* 11336, 12489. Hardware Gap, *Harris* 11543. Sir Johns Peak, *Harris* 11595.
COLOMBIA: Santa Marta, *Smith* 207.
VENEZUELA: Without locality, *Fendler* 1637, 2504.

EXPLANATION OF PLATE 29.—*Isachne rigens*. Specimen from Jamaica, *Harris* 12489. Natural size.

6. **Isachne angustifolia** Nash.

Isachne angustifolia Nash, Bull. Torrey Club **30**: 377. 1903. "On the summit of El Yunque, Luquillo Mountains, Porto Rico, Wilson no. 160." The type, in the New York Botanical Garden Herbarium, is a long branched shoot with numerous leaves and several panicles.

DESCRIPTION.

Culms clambering, as much as 2 meters long and 2 mm. thick, hard and wiry, with a long naked base, branching from the upper nodes, the branches long, leafy, nearly parallel, bearing secondary branches toward the ends, the whole forming a wide, flabellate or loosely corymbose mass, in its most characteristic development pushing through the jungle of stream bank or trail side and hanging over bushes; sheaths appressed papillose-pilose or roughened with papillae, or glabrous, the margin ciliate; ligule a ring of very short stiff hairs less than 0.5 mm. long; blades narrowly lanceolate, 3 to 15 cm. long, but mostly more than 5 cm. long, 5 to 12 mm. wide, rather firm and stiffly spreading, scaberulous or glabrate, papillose-ciliate at base or papillose only; panicles ellipsoid or oblong, as much as 15 cm. long, the branches stiffly ascending or finally spreading, the branchlets and pedicels finally divaricate, these and the main axis scabrous; spikelets about 1.5 mm. long; glumes minutely hispidulous toward the tip; florets and rachilla glabrous.

DISTRIBUTION.

Rocky slopes among brush, Porto Rico (at higher altitudes) and Guadeloupe.
PORTO RICO: Utuado, *Sintenis* 6421. Rio Icaco, *Shafer* 3477. Adjuntas, *Sintenis* 4045. El Yunque, *Sintenis* 1355. Maricao, *Chase* 6222; *Britton & Cowell* 4271. Sierra Luquillo, *Hioram* 369. Cayey, *Chase* 6750. Monte Alegrillo, *Britton, Stevens & Hess* 2566. Monte Torrecilla, *Britton, Cowell & Brown* 5595.
LEEWARD ISLANDS: Guadeloupe, *Duss* 2705.

EXPLANATION OF PLATE 30.—*Isachne angustifolia*. Specimens from Porto Rico, *Chase* 6222 and 6750. Natural size.

7. **Isachne arundinacea** (Swartz) Griseb.

Panicum arundinaceum Swartz, Prodr. Veg. Ind. Occ. 24. 1788. "Jamaica." The type, in the Swartz Herbarium at Stockholm, consists of two shoots, one with a young unexpanded panicle, the other with a spreading panicle past maturity. The glumes of the former are hispid at the summit, of the latter glabrous.

Panicum glaucescens H. B. K. Nov. Gen. & Sp. **1**: 104. 1816. "Crescit locis planis, propatulis Novae Andalusiae juxta Bordones et in excelsis, opacatis Andium prope Pasto." The type, in the Paris Herbarium, "in excelsis prope Pasto," is a shoot with several leaves and a small, rather dense panicle.

Isachne panicea Trin. Gram. Pan. 253. 1826. Trinius unites *Panicum arundinaceum* and *P. dispermum*, giving both names as synonyms, but his description applies better to the first ("Panicula densiuscula").

Isachne arundinacea Griseb. Fl. Brit. W. Ind. 553. 1864. Based on *Panicum arundinaceum* Swartz.

DESCRIPTION.

Culms climbing among shrubs or small trees to a height of as much as 6 meters, as much as 5 mm. thick at base, with strong canes and elongate branches; sheaths glabrous, or rarely slightly scabrous, ciliate on the margin, sometimes a little papillose near the summit, overlapping on the flowering shoots; ligule of stiff hairs as much as 5 mm. long; blades narrowly lanceolate, as much as 20 cm. long and 2 cm. wide, long-acuminate, scabrous, sometimes becoming smoothish, often papillose on the margin at base; panicles ovoid or ellipsoid, as much as 12 cm. long and 10 cm. wide, rounded at summit, the branches ascending or the lower finally spreading, branched from about the middle, the spikelets somewhat aggregate on the branchlets, the panicle thus rather compactly flowered at the periphery, the pedicels 0.5 to 2 mm. long; spikelets about 1.5 mm. long; glumes glabrous or with a few short stiff hairs at the summit; florets glabrous.

DISTRIBUTION.

Wooded hillsides, Jamaica, at an altitude of 1,000 to 2,000 meters; also southern Mexico to South America.

VERACRUZ: Consoquitla, *Liebmann* 331, 332. Mirador, *Liebmann* 333, 335. Orizaba *Müller* 78; *Pringle* 5570. Zacuapan, *Purpus* 2000. Jalapa, *Smith* 1804.

OAXACA: Without locality, *Galeotti* 5868.

CHIAPAS: Chicharras, *Nelson* 3764. Without locality, *Purpus* 7410.

GUATEMALA: Cobán, *Smith* 1854; *Türckheim* 87. Secanquím, *Pittier* 252.

COSTA RICA: Cañas Gordas, *Pittier* 11009. Los Palmares, *Pittier* 10651. Juan Viñas, *Cook & Doyle* 338. La Palma, *Tonduz* 12567. Tucurrique, *Tonduz* 12798, 12970. Chirripó, *Tonduz* 166. La Hondura, *Jiménez* 535.

PANAMA: El Boquete, *Hitchcock* 8277.

JAMAICA: Catherines Peak, *Amer. Gr. Nat. Herb.* 418; *Eggers* 3583. Gordon Town, *Hart* 708. Wallenford, *Harris* 11551, 11567. Content Gap, *Harris* 11517. Abbey Green, *Hitchcock* 9386. Bryans Hill, *Harris* 11529. Cold Spring Gap, *Harris* 11337, 12491. Flamstead, *Harris* 11468, 11581. Whitfield Hall, *Harris* 11583, Mount Lebanon, *Harris* 12487.

COLOMBIA: Santa Marta, *Smith* 210.

VENEZUELA: Carayaca, *Jahn* 305.

BOLIVIA: Yungas, *Bang* 297; *Rusby* 6.

EXPLANATION OF PLATE 31.—*Isachne arundinacea.* Specimen from Jamaica, *Amer. Gr. Nat. Herb.* 418. Natural size.

8. Isachne disperma (Lam.) Doell.

Panicum dispermum Lam. Tabl. Encycl. **1**: 173. 1791. "Ex Amer. Merid. Com. D. Richard." The type, in the Paris Herbarium, is a shoot with 5 leaves and a panicle from which most of the spikelets have fallen, the pedicels slender and spreading. The locality is not indicated on the label, only the name and "ex D. Richard."

Panicum multinerve Desv.; Poir. in Lam. Encycl. Suppl. **4**: 279. 1816. "Cette plante croît aux Antilles. (V. s. in herb. Desv.)." The type, in the Paris Herbarium, is said to be from Porto Rico, "Habitat in Antillis (Portoricensis)," but the statement is probably erroneous as the species is otherwise unknown from that island. The label bears, besides the name *Panicum multinerve* Desv., the name *confertum* Desv. It would appear that this specimen is the type of the latter name also, especially as no other specimen could be found that appeared to be the type.

Panicum confertum Desv.; Poir. in Lam. Encycl. Suppl. **4**: 279. 1816. "Cette plante croît aux Antilles (V. s. in herb. Desv.)." See remarks under *Panicum multinerve* in the preceding paragraph. Poiret describes both species in succeeding paragraphs, but the descriptions do not differ essentially. The blades in both are

described as glabrous, while in *Isachne arundinacea*, the only other species it could be, they are scabrous.

Isachne ? dubia Kunth, Rév. Gram. **1**: 42. 1829. Based on *Panicum dispermum* Lam. The question mark inserted by Kunth is accounted for by his note, "In herbario Richardi non amplius suppetit."

Isachne disperma Doell in Mart. Fl. Bras. **2**^{2}: 274. 1877. Based on *Panicum dispermum* Lam.

DESCRIPTION.

Aspect of plant as in *I. arundinacea;* sheaths glabrous or rarely papillose-hispidulous; ligule hairs as much as 2 mm. long; blades on the average larger than in *I. arundinacea*, glabrous, scabrous toward the apex; panicles as much as 20 cm. long, the branches and branchlets spreading, the spikelets in twos or threes at the ends of the branchlets, the panicle thus more open and flowered more equally throughout than in *I. arundinacea*, the spikelets not strongly aggregate toward the periphery; spikelets slightly over 1 mm. long; glumes and florets glabrous.

DISTRIBUTION.

Mountain woods, Lesser Antilles.

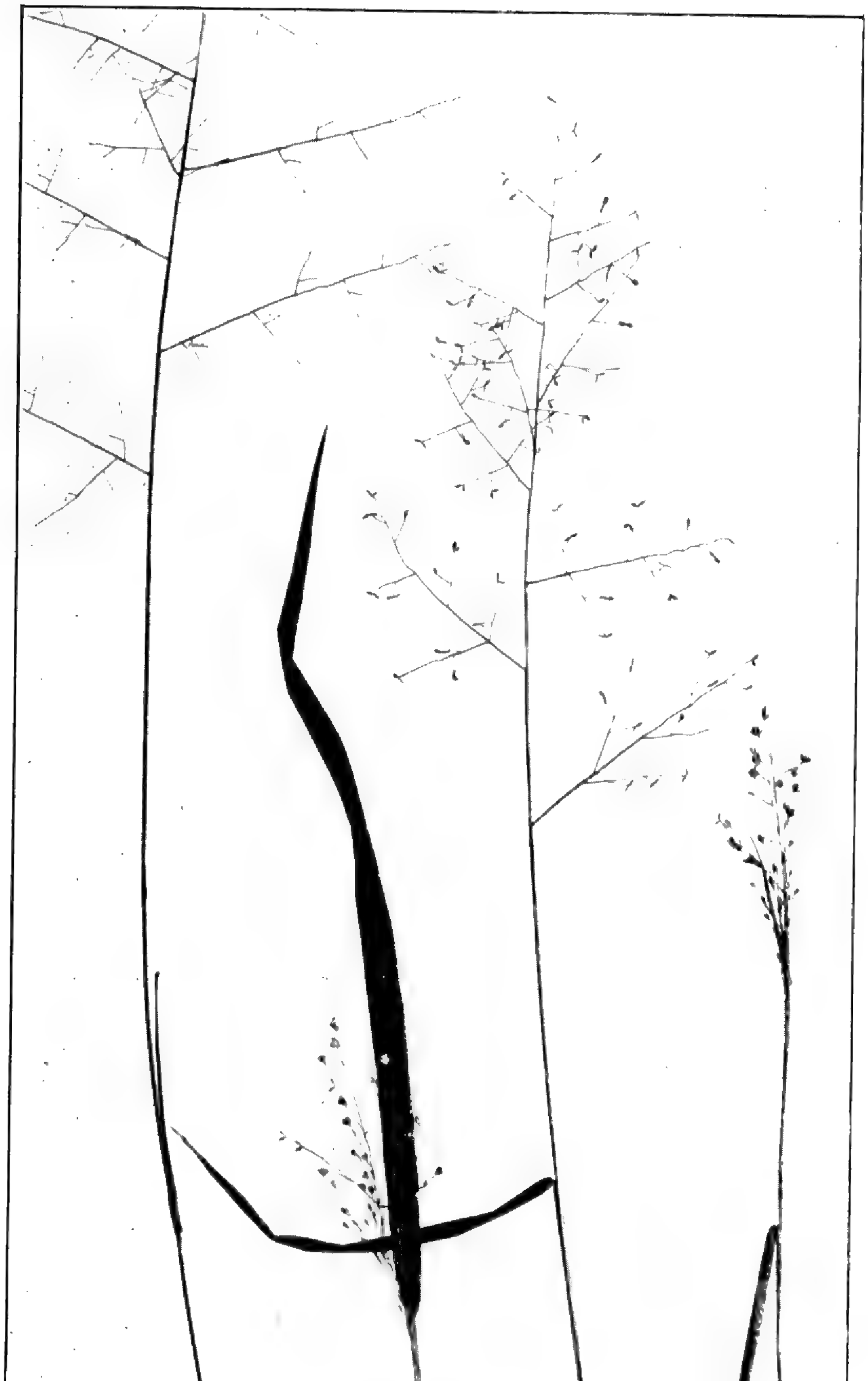
LEEWARD ISLANDS: St. Kitts, *Britton & Cowell* 395. Guadeloupe, *Duss* 3189. Dominica, *Eggers* 1056; *Jones* 38.

WINDWARD ISLANDS: Martinique, *Duss* 1311. Grenada, *Broadway* 76.

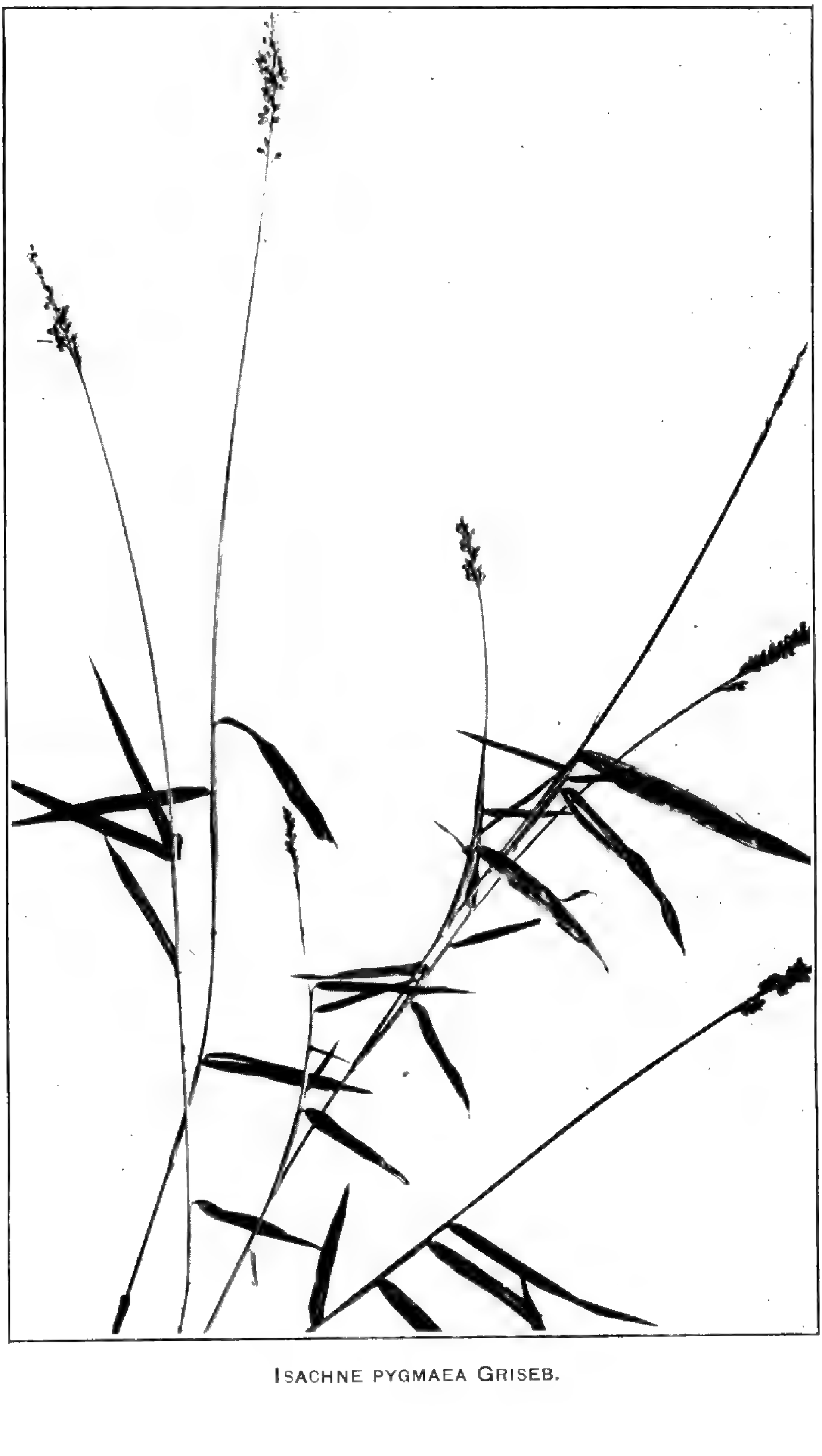
TOBAGO: *Amer. Gr. Nat. Herb.* 597.

EXPLANATION OF PLATE 32.—*Isachne disperma*. Specimen from St. Kitts, *Britton & Cowell* 395. Natural size.

ISACHNE POLYGONOIDES (LAM. DOELL.



ISACHNE LEERSIOIDES GRISEB.



ISACHNE PYGMAEA GRISEB.

ISACHNE RIGIDIFOLIA (POIR.) URBAN.

ISACHNE RIGENS (SWARTZ) TRIN.

ISACHNE ANGUSTIFOLIA NASH.

ISACHNE ARUNDINACEA (SWARTZ) GRISEB.

ISACHNE DISPERMA (LAM.) DOELL.

THE NORTH AMERICAN SPECIES OF OPLISMENUS.

By A. S. Hitchcock.

INTRODUCTION.

This genus of grasses comprises four species in the American tropics and about as many in the tropics of the Old World. All are shade plants with broad flat blades and strongly dorsiventral, creeping sterile shoots. Nearly all the species have been referred to the four genera *Panicum*, *Oplismenus*, *Orthopogon*, and *Echinochloa*, which fact accounts for much of the extended synonymy. One species is found in the United States along the coast from North Carolina to Florida and Texas.

The text figures are natural size.

DESCRIPTION OF THE GENUS AND SPECIES.

OPLISMENUS Beauv.

Oplismenus Beauv. Fl. Owar. **2:** 14. *pl. 68. f. 1.* 1809. A single species, *O. africanus*, is described and figured. The name is occasionally spelled *Hoplismenus*.

Orthopogon R. Br. Prodr. Fl. Nov. Holl. 194. 1810. Four species are described and two, *Panicum hirtellum* and *P. burmanni*, are mentioned in a note as belonging to the genus. The first, *O. compositus*, is accepted as the type because it is based on a Linnaean species (*Panicum compositum* L.), while the other three species are described as new.

Hekaterosachne Steud. Syn. Pl. Glum. **1:** 118. 1854. A single species, *H. elatior*, from New Zealand is described. Cheeseman [1] refers this to *Oplismenus*.

Hippagrostis Kuntze. Rev. Gen. Pl. **2:** 776 1891. Kuntze accepts *Hippagrostis* Rumpf.[2] The type is *Panicum burmanni* Retz.

DESCRIPTION.

Usually weak, freely branching, creeping annuals or perennials with erect or ascending flowering shoots, flat, thin, ovate or lanceolate, asymmetric blades, and one-sided spikelike racemes along a main axis. Spikelets terete or somewhat compressed laterally, subsessile, in pairs or solitary in two rows on one side of a narrow, scabrous or hairy rachis. Glumes subequal, emarginate or entire, the midnerve extending into an awn, that of the first longer. Sterile lemma exceeding the glumes and fruit, notched or entire, mucronate or short-awned, inclosing a hyaline palea. Fruit elliptic, acute, the lemma very convex or boat-shaped, the firm margins clasping the palea, inrolled.

The genus consists of four species in the American tropics and about as many more in the tropics of the Old World. One of the American species has been introduced.

The species are shade-loving, growing on the forest floor or in shade of orchards and groves, often forming a carpet.

[1] Man. New Zeal. Fl. 849. 1906.

[2] Herb. Amboin. **6:** 14. *pl. 5. f. 3.* 1750.

KEY TO THE SPECIES.

Awns antrorsely scabrous; plants annual.....1. **O. burmanni**
Awns smooth or obscurely roughened; plants perennial.
  Rachis of racemes mostly 2 to 3 mm. long, bearing usually not more than 5 spikelets; blades 1 to 3 cm. long, 4 to 10 mm. wide.....**2. O. setarius.**
  Rachis of lower racemes more than 1 cm. long, bearing usually more than 8 spikelets; blades mostly more than 4 cm. long, 1 to 2 cm. wide.
    Racemes closely flowered, the lower 1 to 2 cm. long.....**3. O. hirtellus.**
    Racemes loosely flowered, the lower 2 to 5 cm. long, the lower pairs of spikelets as much as 1 cm. apart.....**4. O. rariflorus.**

1. Oplismenus burmanni (Retz.) Beauv.

Panicum hirtellum Burm. Fl. Ind. 24. *pl. 12. f. 1.* 1768. Not *Panicum hirtellum* L. 1759. "Habitat in Indiis utrisque." The plate is rather crude but evidently represents the species now called *Oplismenus burmanni.*

Panicum burmanni Retz. Obs. Bot. **3:** 10. 1783. The name is based on *Panicum hirtellum* Burm., but the species is briefly described and a specimen is said to have been sent by Koenig.

Panicum bromoides Lam. Tabl. Encycl. **1:** 170. 1791. "Ex. ins. Franciae. *Commers.*" The type has not been examined, but the reference in the description to hirsute spikes and short blades appears to identify the species with *Oplismenus burmanni*, to which species the name is referred by most authors.

Oplismenus africanus Beauv. Fl. Owar. **2:** 15. 1809. The localities given with the description are "Chama, Koto, Oware & Benin," on the coast of Guinea. The plate identifies the species.

Oplismenus bromoides Beauv. Ess. Agrost. 54. 1812. Presumably based on *Panicum bromoides* Lam., though no direct reference to that species is given. Beauvois merely says that *Oplismenus* includes "Panici spec. Lin., etc.," and makes several combinations under *Oplismenus*, one of which is *O. bromoides.*

Oplismenus burmanni Beauv. Ess. Agrost. 54. 1812. Based on *Panicum burmanni* Retz.

Panicum album Poir. in Lam. Encycl. Suppl. **4:** 274. 1816. "Cette plant croît à l'île de Java. (V. S. in herb. Desfont.)." The type has not been examined, but the description appears satisfactory for the reference of the name to *Oplismenus burmanni.*

Panicum africanum Poir. in Lam. Encycl. Suppl. **4:** 275. 1816. Based on *Oplismenus africanus* Beauv.

Oplismenus albus Roem. & Schult. Syst. Veg. **2:** 890. 1817. Based on *Panicum album* Poir.

Orthopogon burmanni Trin. Fund. Agrost. 181. 1820. Based on *Panicum burmanni* Retz.

Oplismenus brasiliensis Raddi, Agrost. Bras. 40. 1823. "Invenitur in montanis prope *Tejucco*, necnon in Monte nuncupato *Corcovado.*" This is referred by Doell [1] to *Panicum compositum*, but the description applies well to *Oplismenus burmanni* (*Panicum burmanni* of Doell).

Oplismenus affinis Schult. Mant. **2:** 273. 1824. "In St. Martha [Colombia]. Bertero." The ample description applies well to *Oplismenus burmanni.*

Panicum lappaceum Willd.; Spreng. Syst. Veg. **1:** 306. 1825. Mentioned as a synonym of *Orthopogon burmanni.* The type, collected by Humboldt in "America merid.," has been examined in the Willdenow Herbarium at Berlin.

Orthopogon africanus Sweet, Hort. Brit. 448. 1826. Based on *Oplismenus africanus* "R. S."

Oplismenus humboldtianus Nees, Agrost. Bras. 264. 1829. "Habitat in Brasilia variis locis (Mart.)." Nees considers the Brazilian plant different from the East Indian species and bases the name upon *Oplismenus burmanni* as described by Humboldt, Bonpland, and Kunth.

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[1] Mart Fl. Bras. 2^2: 146. 1877.

Oplismenus cristatus Presl, Rel. Haenk. 1: 323. 1830. "Hab. in Mexico." The type, in the German University at Prague, is labeled as coming from Luzón.

Oplismenus affinis Presl, Rel. Haenk. 1: 323. 1830. "Hab. in Panama." The name is independent of *O. affinis* Schult. The type has been examined at the German University in Prague. Presl states that it is probably only a variety of *O. cristatus*.

Orthopogon bromoides Loud. Hort. Brit. 25. 1830. Presumably based on *Panicum bromoides* Lam., though no synonymy is cited.

Panicum francoi Steud. Syn. Pl. Glum. 1: 44. 1854. "Franco legit in Oaxaca." The type has not been examined, but the description applies to *Oplismenus burmanni*.

Panicum raddianum Steud. Syn. Pl. Glum. 1: 45. 1854. Based on *Oplismenus brasiliensis* Raddi.

Panicum sanctae-marthae Steud. Syn. Pl. Glum. 1: 45. 1854. "Hrbr. *Funck* nr. 437. Sancta Martha Venezuelae." The type has not been examined, but the description applies to *Oplismenus burmanni*.

Panicum schultesii Steud. Syn. Pl. Glum. 1: 46. 1854. Based on *Oplismenus affinis* Schult.

Oplismenus humboldtianus β muticus Fourn. Mex. Pl. 2: 37. 1886. "Cuernavaca (Bourg. n. 1301)." This collection, as well as *Müller* 2016 and 2019 cited by Fournier, is represented in the U. S. National Herbarium.

There are several other synonyms in works on Old World floras.

DESCRIPTION.

Plants annual; culms slender, glabrous or pubescent in lines or sometimes pubescent all over, the flowering shoots as much as 40 cm. long, usually 10 to 20 cm. long, ascending or nearly prostrate; sheaths glabrous or papillose-hispid, striate, ciliate on the margin, villous on the collar; ligule a very short membrane, ciliate with hairs about 1 mm. long; blades ovate to ovate-lanceolate, mostly 2 to 5 cm. long, sometimes longer, 1 to 1.5 cm. wide, thin, more or less pubescent or hispid on both surfaces, especially toward the base, usually undulate on the margin; panicle ovoid to linear mostly long-exserted, usually compact, 2 to 5 cm. long, sometimes as much as 10 cm. long, and the spikes more distant, mostly nodding, the main axis villous; racemes 3 to several, appressed or ascending, rather short and thick, white and silky, mostly 8 to 15 mm. long, the spikelets closely set and nearly sessile on the rachis, this softly villous and also beset, especially at the base of the spikelets, with stiff papillose hairs 2 to 3 mm. long; spikelets compressed, whitish, several to many on each rachis; first glume 3-nerved, half as long as the sterile lemma, rather sparsely appressed-villous, notched at the apex, the midnerve extending as a slender, straight, antrorsely scabrous awn 10 to 15 mm. long; second glume similar to the first, a little longer, 5-nerved, the awn shorter; sterile lemma similar to the glumes, about 3 mm. long, compressed above, nearly terete below, about 7-nerved, the lower half often copiously villous, the awn shorter than those of the glumes, commonly 1 to 3 mm. long; fruit smooth and shining, about as thick as wide, pale or brownish, about 2 mm. long.

FIG. 21.—*Oplismenus burmanni*. From *Reko* 3473 Mexico.

DISTRIBUTION.

Tropics of both hemispheres, introduced in America; common in waste places, along roads, especially in partially shaded places, southern Mexico to northern South America; also in Santo Domingo.

LOWER CALIFORNIA: Sierra de la Laguna, *Brandegee* 5 in 1890. Miraflores, *Brandegee* 22 in 1890.

SINALOA: Lodiego, *Palmer* 1666 in 1891.

TEPIC: Tepic, *Palmer* 1930 in 1892.

JALISCO: Guadalajara, *Palmer* 463 in 1886; *Hitchcock* 7279. Zapotlán, *Hitchcock* 7250.

COLIMA: Colima, *Palmer* 1258 in 1891; *Orcutt* 4529.

MICHOACÁN: La Correa, *Langlassé* 440. Morelia, *Arsène* in 1909.

VERACRUZ: Zacuapan, *Purpus* 2893. Orizaba, *Müller* 2016.

MORELOS: Cuernavaca, *Pringle* 6209; *Bourgeau* 1301. Yautepec, *Pringle* 11320.

GUERRERO: Acapulco, *Palmer* 35 in 1895.

OAXACA: Cuicatlán, *Nelson* 1649. Guatulco, *Liebmann* 375. Cafetal Concordia, *Reko* 3473.

CHIAPAS: Sierra de Tonala, *Purpus* 7412.

YUCATÁN: Izamal, *Gaumer* 1038. Calotmul, *Gaumer* 2429. Without locality, *Schott* 55.

GUATEMALA: Amatitlán, *Türckheim* 8787; *Popenoe* 702. Totonicapam, *Seler* 2360. Volcán Pacaya, *Kellerman* 6235. Retalhuleu, *Kellerman* 6266. Ciudad Vieja, *Tejada* 115. Cobán, *Türckheim* 1363. Volcán Chingo, *Shannon* 3672. San Juan Arana, *Heydé & Lux* 6276. Santa Rosa, *Heyde & Lux* 4297. Santa Ana, *Türckheim* 473. Guatemala City, *Hitchcock* 9044, 9052. Without locality, *Heyde* 648.

SALVADOR: La Unión, *Hitchcock* 8790. Volcán San Salvador, *Hitchcock* 8949. San Salvador, *Velasco* 14.

HONDURAS: Amapala, *Hitchcock* 8765. San Pedro Sula, *Thieme* 5581.

NICARAGUA: Masaya, *Hitchcock* 8634, 8660. Ometepe Island, *Smith* 1075. Jinotepe, *Hitchcock* 8725.

COSTA RICA: San José, *Jiménez* 7, 8, 9, 156, 157, 158; *Tonduz* 1811, 3120, 7190, 7233, 7276, 8458, 9841; *Pittier* 3124; *Hitchcock* 8450, 8484. Alajuelita, *Jiménez* 898. La Palma, *Pittier* 731. Santo Domingo, *Tonduz* 7194, 9939. Santa Bárbara, *Pittier* 1678. Surubres, *Biolley* 7002, 17381. Boruca, *Pittier* 4466. Rodeo, *Pittier* 1612. Boca de Zhorquin, *Tonduz* 8637. Zent Farm, *Pittier* 16738. Nicoya, *Tonduz* 13758; *Cooper* 10378. Desamparados, *Tonduz* 1481. Piedra del Convento, *Tonduz* 3653. Turrialba, *Tonduz* 8229. Rodeo de Pacaca, *Pittier* 3330. Carrillo, *Biolley* 3113. Puntarenas, *Hitchcock* 8541, 8542. Atenas, *Hitchcock* 8520. Alajuela, *Jiménez* 704. Río Bebedero, *Jiménez* 738, 741. Hacienda La Colombiana, *Tonduz* 224. Río Blanco, *Lehmann* 1781.

PANAMA: El Boquete, *Hitchcock* 8304. Ancón, *Celestine* 83. Masambí, *Maxon* 4688. Culebra, *Amer. Gr. Nat. Herb.* 421; *Pittier* 2086. Chagres, *Fendler* 363. Bocas del Toro, *Hart* 74. San Felix, *Pittier* 5205. Coclé, *Pittier* 4887. Empire, *Hitchcock* 7951. Matías Hernández, *Pittier* 6822. Balboa, *Killip* 4180.

SANTO DOMINGO: Constanza, *Türckheim* 2883. Maniel de Ocoa, *Türckheim* 3610.

COLOMBIA: Santa Marta, *Smith* 157, 2573. Popayán, *Lehmann* 5936. Cauca, *Lehmann* 2106. Cuesta de Tocotá, *Pittier* 699. Huila, *Pittier* 1272, 1526. Without locality, *Linden* 1559.

VENEZUELA: Caracas, *Rose* 21962. Without locality, *Fendler* 1705.

BRAZIL: Cuyabá, *Malme* 3128.

2. **Oplismenus setarius** (Lam.) Roem. & Schult.

Panicum setarium Lam. Tabl. Encycl. **1**: 170. 1791. "Ex Amer. merid.—Commun. a D. Richard." The type, in the Lamarck Herbarium at Paris, is a single culm with several leaves and three racemes.

Oplismenus setarius Roem. & Schult. Syst. Veg. **2**: 481. 1817. Based on *Panicum setarium* Lam.

Orthopogon parvifolium Nutt. Gen. Pl. **1**: 55, errata. 1818. Nuttall at first referred this to *O. hirtellum* (*Panicum hirtellum* L.), giving the range as Florida to South Carolina. In the errata he changes the name to *O. parvifolium* and gives a new description.

Orthopogon setarius Spreng. Syst. Veg. **1**: 306. 1825. Based on *Panicum setarium* Lam.

Oplismenus parvifolius Kunth, Rév. Gram **1**: 45. 1829. Based on *Orthopogon parvifolius* Nutt.; placed by Kunth among species dubiae.

Panicum nuttallianum Steud. Nom. Bot. ed. 2. **2**: 260. 1841. Based on *Orthopogon parvifolius*.

DESCRIPTION.

Culms slender and lax, the flowering branches ascending or nearly prostrate, usually not more than 10 to 20 cm. long, sometimes as much as 30 cm., glabrous or pubescent in lines; sheaths glabrous, villous on the margin, pubescent about the collar; ligule a very short ciliate membrane; blades ovate to ovate-lanceolate, thin, mostly 1 to 3 cm. long, 4 to 10 mm. wide, sparsely pilose on both surfaces or glabrate; panicle long-exserted, usually not over 5 cm. long, rarely as much as 8 cm., the axis scabrous or puberulent; racemes usually 3 to 5, rarely as many as 8, short and subglobose, distant or the upper approximate, the lower internode sometimes as much as 2 cm. long, the rachis usually 2 to 3 mm. long, rarely as much as 5 mm. long (or a little longer in some United States specimens), puberulent, pubescent, or villous at base; spikelets rarely as many as 8 on a rachis, usually not more than 5, the lowermost sometimes reduced to awns; glumes more than half as long as the sterile lemma, appressed-hispidulous, often more or less pilose along the margin, more or less notched at apex, the first 3-nerved, the awn mostly 4 to 8 mm. long, smooth, the second 5-nerved, the awn much shorter, usually 2 to 3 mm. long; sterile lemma 2 to 3 mm. long, 7-nerved, appressed-pilose above, the awn short or wanting; fruit about 2.5 mm. long.

DISTRIBUTION.

Shaded places along the coast, North Carolina to Florida and Texas; southern Mexico to Guatemala; West Indies; Trinidad to Paraguay.

North Carolina: Ocracoke Island, *Kearney* 2321.

Georgia: Lumpkin, *Latimer* in 1885. Bainbridge, *Harper* 1235. Brunswick, *Chase* 7086. Union, *Harper* 1084. Georgetown, *Harper* 1746.

Florida: Jupiter, *Curtiss* 5553. Orange County, *Baker* 30. Tampa, *Combs* 1402. Tallahassee, *Nash* 2524. Mouth St. Johns River, *Curtiss* 3595. Old Town, *Combs* 864. Fort Myers, *Hitchcock* 467. Manatee, *Rugel* 379. Miami, *Hitchcock* 672. Eustis, *Chase* 4044. Fellsmere, *Tracy* 9307. Key West, *Blodgett*. Jacksonville, *Curtiss* 4037, 5301. Brevard County, *Fredholm* 5504, 6139. Orange Glade, *Eaton* 593. Sebastian, *Fredholm* 5504. Bartow, *Combs* 1239. Homosassa, *Combs* 968. Grasmere, *Combs* 1044. Palm Beach, *Hitchcock* 2337. Gainesville, *Chase* 4243.

Alabama: Mobile, *Mohr* in 1878. Tuscaloosa, *Smith*.

Mississippi: Ocean Springs, *Tracy* 4533. Biloxi, *Chase* 4361. Nicholson, *Kearney* 366.

Arkansas: Fulton, *Bush* 982.

Louisiana: Plaquemines County, *Langlois* 53. Houma, *Wurzlow* in 1913. Burnside, *Combs* 1415.

Texas: Houston, *Fisher* 1805; *Hall* 837. Terrell, *Tyler* in 1904. Columbia, *Bush* 299, 1428. Hockley, *Thurow*. Georgetown, *Palmer* 1339 in 1880. Beckville, *Reverchon* in 1902. San Antonio, *Hitchcock* 5249; *Plank* 57, 95; *Bush* 1218. New Braunfels, *Lindheimer* 1263.

Veracruz: Orizaba, *Seaton* 63; *Botteri* 136; *Müller* 2021. Córdoba, *Hitchcock* 6445.

CHIAPAS: Ocuilapa, *Nelson* 3025.
QUINTANA ROO: Cozumel Island, *Millspaugh* 1483.
GUATEMALA: Guatemala City, *Hitchcock* 9110. La Vega, *Heyde & Lux* 6275. Pansamalá, *Türckheim* 1331.

FIG. 22.—*Oplismenus setarius*. From *Hitchcock* 9415, Jamaica.

BERMUDA: *Brown & Britton* 13; *Harris* 424; *Collins* 150.
BAHAMAS: New Providence, *Britton* 3200.
CUBA: Hanábana, *Wright* 1543. Campo Florido, *León* 4139. Cojimar River, *on* 4720.

JAMAICA: Mount Hybla, *Harris* 11307. Clyde River, *Harris* 11446. Stony Hill, *Harris* 11339. Hardware Gap, *Harris* 11843. Bryans Hill, *Harris* 6826. Castleton, *Harris* 11342; *Amer. Gr. Nat. Herb.* 600. Blue Hole, *Fredholm* 3196. Gordon Town, *Hart* 578. Kingston, *Hitchcock* 9468. Ramble, *Hitchcock* 9521. Abbey Green, *Hitchcock* 9358. Savanna-la-Mar, *Hitchcock* 9871. Barican, *Hitchcock* 9568. Montego Bay, *Hitchcock* 9681. Ipswich, *Hitchcock* 9621. Newcastle, *Hitchcock* 9337. Ewarton, *Hitchcock* 9415. Catherines Peak, *Hitchcock* 9731, 9737. Troy, *Hitchcock* 9783; *Maxon* 2951. Content Gap, *Harris* 11364.

SANTO DOMINGO: *Poiteau* in 1807.

PORTO RICO: Arecibo, *Chase* 6556. Vega Baja, *Chase* 6413. Sierra de Luquillo, *Chase* 6721. Cayey, *Sintenis* 2225, 2286. Mayaguez, *Sintenis* 72b; *Holm* 124. Vieques, *Shafer* 2626; *Chase* 6682. Culebra, *Britton & Wheeler* 106.

VIRGIN ISLANDS: St. Croix, *Rose* 3625; *Ricksecker* 250. Antigua, *Rose* 3485; *Wullschlaegel* 626. St. Thomas, *Eggers*.

LEEWARD ISLANDS: Guadeloupe, *Duss* 2714.

WINDWARD ISLANDS: Martinique, *Duss* 778b.

TRINIDAD: Tabaquite, *Hitchcock* 10126.

ECUADOR: Galápagos Islands, *Stewart* 1283.

BRAZIL: Campinas, *Campos Novaes* 1255, 1290. Bahia, *Riedel*. Novo Niagara, *Edwall* 3864. Curityba, *Dusén* 7906. Rio Grande do Sul, *Lindman* 977, 1569.

PARAGUAY: Pilcomayo, *Rojas* 74. Without locality, *Page* (Paraguay Exped.) in 1854.

3. Oplismenus hirtellus (L.) Beauv.

Panicum hirtellum L. Syst. Nat. ed. 10. **2**: 870. 1759. No locality given. The type, in the Linnaean Herbarium, is from Jamaica, having been sent to Linnaeus by Browne. The specimen is the upper part of a flowering culm with seven racemes and two leaves, with glabrous sheaths.

Milium undulatifolium Moench, Meth. Pl. 202. 1794. A garden specimen is described and *Panicum hirtellum* L. is given as synonym. *Panicum undulatifolium* Ard.[1] is not mentioned. Moench's name is evidently independent of that, which has been applied to an Old World species.

Oplismenus hirtellus Beauv. Ess. Agrost. 54, 168. 1812. Based on *Panicum hirtellum* L.

Orthopogon hirtellus Nutt. Gen. Pl. **1**: 55. 1818. The name is based on *Panicum hirtellum* L., but the plant described by Nuttall is *Oplismenus setarius*. In the errata Nuttall changes the specific name to *parvifolium* (see a preceding paragraph under *Oplismenus setarius*).

Panicum velutinum Meyer, Prim. Fl. Esseq. 51. 1818. "In nemorosis plantationis Sophienburg," Essequibo. A duplicate type has been examined in the Trinius Herbarium, having been sent to Trinius by Meyer. The sheaths are pubescent.

Oplismenus velutinus Schult. Mant. **2**: 271. 1824. Based on *Panicum velutinum* Meyer.

Echinochloa cubensis Schult. Mant. **2**: 596. 1824. This citation has not been verified.

Orthopogon cubensis Spreng. Syst. Veg. **1**: 307. 1825. "Cuba." The type of this has not been examined.

Oplismenus cubensis Kunth, Rév. Gram. **1**: 45. 1829. Based on *Orthopogon cubensis* Spreng.

Panicum cubense Steud. Nom. Bot. ed. 2. **2**: 255. 1841. Based on *Orthopogon cubensis* Spreng.

Oplismenus chondrosioides Fourn. Mex. Pl. **2**: 39. 1886. "Absque loco (LIEBM. n. 367); Cordova (BOURG. n. 1668, SCHAFFN. n. 281 b.)." The first specimen cited may be taken as the type. This has been examined in the Copenhagen Herbarium. It has hispid sheaths. The name is on the label in Fournier's hand.

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[1] Animad. Spec. Alt. 14. *pl. 4*. 1764.

DESCRIPTION.

Plants perennial; culms widely creeping and branching, the flowering culms usually erect from an ascending base, as much as 70 cm. tall but usually about 30 cm., glabrous or somewhat pubescent; sheaths glabrous or densely papillose-hispid; ligule membranous, about 0.5 mm. long, short-ciliate; blades lanceolate or oblong-lanceolate, mostly 5 to 10 cm. long, 1 to 2 cm. wide, rather abruptly narrowed above into an acuminate apex, glabrous or pubescent, papillose-ciliate at base; panicle long-exserted, 5 to 10 cm. long, the main axis pubescent, or the lower part nearly glabrous, the lowest internode commonly about 2 cm. long; racemes mostly 3 to 7, ascending or spreading, rather distant, compact or sometimes rather loose, the lowermost 1 to 2 cm. long, the rachis pubescent and also papillose-hispid; spikelets in pairs, the pairs alternating on two sides of the triangular rachis, appressed-villous or hispid or nearly glabrous, green or, especially the awns, purple; glumes nearly equal, a little more than half as long as the sterile lemma, more or less notched at apex or tapering into the rather stout smooth awn, the first 5-nerved, with an awn 5 to 10 mm. long, the second 7-nerved, the awn once or twice as long as the glume, sometimes shorter; the sterile lemma 2.5 to 3 mm. long, 7-nerved, usually notched at apex, the awn mostly 1 to 2 mm. long, sometimes wanting; fruit 2 to 2.5 mm. long.

FIG. 23.—*Oplismenus hirtellus*. From *Amer. Gr. Nat. Herb.* 602, Trinidad.

There are two forms of this species, one with glabrous sheaths and one with hispid sheaths, which appear, when growing, rather distinct. The forms differ in no other way, however, and are found growing together under the same conditions, but all the shoots originating from a given plant are of one form.

A form of *Oplismenus* with variegated foliage, found in the West Indies, appears to belong to *O. compositus* (L.) Beauv., an allied Asiatic species (Guadeloupe, *Duss* 3155; Dominica, *Jones* 37; Martinique, *Duss* 1325; Grenada, *Hitchcock* 17674).

DISTRIBUTION.

Moist woods and shady banks, southern Mexico and throughout the West Indies to South America.

MICHOACÁN: Morelia, *Arsène* in 1909.

VERACRUZ: Minatitlán, *Smith* 575. Sanborn, *Orcutt* 3067. Jalapa, *Hitchcock* 6636, 6637, 6681. Orizaba, *Botteri* 724; *Purpus* in 1903; *Smith* 578. Colipa, *Liebmann* 363, 364. Mirador, *Nelson* 109. Córdoba, *Amer. Gr. Nat. Herb.* 422; *Karwinsky* 965. San Sebastián, *Liebmann* 371. Jicaltepec, *Liebmann* 366.

MORELOS: Cuernavaca, *Pringle* 6203; *Amer. Gr. Nat. Herb.* 423; *Bourgeau* 1302.

TABASCO: San Juan Bautista, *Rovirosa* 67, 83.

MEXICO (Republic of): Without locality, *Liebmann* 366, 367.

GUATEMALA: Laguna de Ayarza, *Heyde & Lux* 3922. Secanquím, *Maxon & Hay* 3154. Guatemala City, *Hitchcock* 9054. Sepacuité, *Cook & Griggs* 225. Trece Aguas, *Goll* 96. Cobán, *Türckheim* 438. Cubilquitz, *Türckheim* 8802.

SALVADOR: Volcán San Salvador, *Hitchcock* 8930. San Salvador, *Renson* 63.

HONDURAS: San Pedro Sula, *Thieme* 323, 5581 in part. Ruatán Island, *Gaumer* 136. Puerto Sierra, *Wilson* 208.

COSTA RICA: Las Mesas, *Pittier* 3115. Rodeo, *Pittier* 1618. Santa Rosa, *Tonduz* 12272. Mano de Tigre, *Pittier* 4632. Río Unión, *Pittier* 3652. San José, *Hitchcock* 8481, 8500; *Jiménez* 129, 170; *Cooper* 5994. Cartago, *Cooper* 168. Buenos Aires, *Tonduz* 4877. Boruca, *Tonduz* 4465.
PANAMA: Chiriquí Volcano, *Hitchcock* 8194. Gatún, *Amer. Gr. Nat. Herb.* 424. Bocas del Toro, *Hart* 83. El Boquete, *Hitchcock* 8309, 8312.
CUBA: Monte Verde, *Wright* 751. Sierra de Anafe, *Wilson* 11332. Río San Miguel, *Wilson* 9280. Río Cayaguateje, *Shafer* 10444. Woodfred, *Shafer* 3011. Matanzas, *Rugel* 189; *Britton & Wilson* 14016; *Palmer & Riley* 12. Cienfuegos, *Pringle* 76. El Guama, *Palmer & Riley* 146. Vento, *Léon* 556; *Curtiss* 593. San Antonio, *Hitchcock* 489. Santiago de las Vegas, *Hitchcock* 488. Bagamesa, *Eggers* 4655. Guanajay, *Baker* 3461. Isle of Pines, *Curtiss* 268; *Britton & Wilson* 14616.
JAMAICA: Ferry River, *Harris* 11784, 11787; *Hitchcock* 9748. Temple Hall, *Harris* 11359. Flamstead, *Harris* 11465. Castleton, *Harris* 11607. Hope Gardens, *Harris* 11253. Appleton, *Hitchcock* 9660. Port Antonio, *Millspaugh* 924.
SANTO DOMINGO: Without locality, *Wright, Parry & Brummel* 613. Rincón, *Fuertes* 1282.
PORTO RICO: Aibonito, *Sintenis* 2870. Ponce, *Heller* 6303. Coamo, *Goll* 623. Cayey, *Chase* 6743. Adjuntas, *Chase* 6476. Maricao, *Chase* 6189, 6229; *Sintenis* 72.
LEEWARD ISLANDS: Guadeloupe, *Duss* 3826, 4056. Dominica, *Jones* 50.
WINDWARD ISLANDS: Martinique, *Duss* 778. Grenada, *Broadway* 1104, 2918, 4670.
TRINIDAD: Manzanillo, *Hitchcock* 10368. Port of Spain, *Hitchcock* 9964, 10010, 10197, 10198; *Amer. Gr. Nat. Herb.* 601, 602. Icacos, *Broadway* 4958. Caparo Woods, *Broadway* 4928. Tabaquite, *Hitchcock* 10123. Without locality, *Bot. Gard. Herb.* 1328, 2258, 2259, 3224.
TOBAGO: *Hitchcock* 10222, 10241, 10252, 10266, 10271; *Broadway* 3996, 4564, 4817.
COLOMBIA: Huila, *Pittier* 1263. Santa Marta, *Smith* 212, 2168, 2169.
VENEZUELA: Siquire Valley, *Pittier* 5976. Caracas, *Rose* 21775.
DUTCH GUIANA: Without locality, *Hostman*.
BRAZIL: São Paulo, *Edwall* 3865. Blumenau, *Ule* 882. Minas Geraes, *Regnell* 1373, 1375. Bahia, *Salzmann; Riedel* in 1831. Campinas, *Campos Novaes* 1289. Rio Grande do Sul, *Malme* 1419. Cuyabá, *Malme* in 1902. Without locality, *Capanema* 740.
PERU: San Miguel, *Cook & Gilbert* 938.
BOLIVIA: Yungas, *Bang* 2079; *Rusby* 41.
PARAGUAY: Central Paraguay, *Morong* 315.
URUGUAY: Montevideo, *Arechaveleta*.
ARGENTINA: Misiones, *Ekman* 657.

4. **Oplismenus** *rariflorus* Presl.

Oplismenus rariflorus Presl, Rel. Haenk. **1**: 320. 1830. "Acapulco." The type has been examined at the German University of Prague. It consists of a complete flowering shoot.

Oplismenus latifolius Haenke; Steud. Nom. Bot. ed. 2. **2**: 220. 1841. A herbarium name mentioned as a synonym of *Panicum loliaceum*. The type, from Peru, is *O. rariflorus*.

Panicum parciflorum Steud. Syn. Pl. Glum. **1**: 45. 1854. "Acapulco." This is based on *Oplismenus rariflorus* Presl, the name changed and the description slightly altered. The synonym cited, *Oplismenus hirtiflorus* Presl, is a slip of the pen, as Presl mentions no species by that name.

Oplismenus liebmanni Fourn. Mex. Pl. **2**: 38. 1886. "Absque loco (LIEBM. n. 374); Zacuapan (LIEBM. n. 373); in savanis inter La Galera et Pochutla, in declivitate occidentali Cordillearum (LIEBM. n. 372)." The third specimen cited, *Liebmann* 372, has been examined in the Copenhagen Herbarium.

Oplismenus thiebauti Fourn. Mex. Pl. **2**: 39. 1886. "Secus rivulum prope Acapulco (THIÉBAUT n. 1074)." This specimen has not been examined. The description, especially "spiculis remote binatis," and the locality indicate *O. rariflorus*.

DESCRIPTION.

Culms sparingly branched, ascending from a decumbent base, as much as 50 cm. tall but mostly less, glabrous or sometimes pubescent; sheaths glabrous or pubescent, densely ciliate on the margin, villous on the collar; ligule a short ciliate membrane; blades lanceolate or elliptic-lanceolate, mostly about 4 to 7 cm. long, rarely as much as 13 cm., 1 to 2 cm. wide, thin, glabrous, scabrous, or sparsely pilose; panicle long-exserted, the main axis 5 to 15 cm. long, scabrous; racemes several, the lower distant, 2 to 5 cm. long or even 7 cm., ascending, loosely flowered, the rachis scabrous, often villous at base and pilose at the insertion of the spikelets; spikelets scattered, appressed to the rachis, the lower pairs as much as 1 cm. apart; glumes more than half as long as the sterile lemma, glabrous or hispidulous, rarely pilose, tapering into a smooth awn, the first 3-nerved, the awn 3 to 8 mm. long, rarely longer, the second 5-nerved, the awn very short or wanting; sterile lemma 3 mm. long, mostly awnless; fruit 2.5 mm. long.

This species is well distinguished by its long loose racemes.

FIG. 24.—*Oplismenus rariflorus*. From *Hitchcock* 9046, Guatemala.

DISTRIBUTION.

Moist shady places, Mexico and Guatemala; Ecuador and Peru.

SINALOA: Lodiego, *Palmer* 1656 in 1891.
TEPIC: Tepic, *Palmer* 1931 in 1892.
JALISCO: Zapotlán, *Hitchcock* 7237.
COLIMA: Manzanillo, *Palmer* 1090 in 1890.
MICHOACÁN: La Correa, *Langlassé* 444. Morelia, *Arsène* in 1909.
OAXACA: Pochutla, *Liebmann* 372. Reyes, *Nelson* 1772. Sierra de San Felipe, *Pringle* 4944.
GUATEMALA: Guatemala City, *Hitchcock* 9046.
ECUADOR: El Recreo, *Eggers* 14897.
PERU: Mountains of Huanuco, *Haenke* (described as *O. loliaceus* Beauv. by Presl).[1]

DOUBTFUL SPECIES.

OPLISMENUS DEPAUPERATUS Fourn. Mex. Pl. **2**: 38. 1886. "Orizaba (F. MÜLL. n. 2019 in meo herbario, SCHAFFN. n. 207 in herb. FRANQ.); in Cordillera Oajacensi (GAL. n. 5847)."

[1] Rel. Haenk. **1**: 320. 1830.

THE NORTH AMERICAN SPECIES OF ECHINOCHLOA.

By A. S. Hitchcock.

INTRODUCTION.

In earlier works this group of grasses was usually included as a section in the great genus *Panicum*. The species form a compact group which according to the modern concept is assigned to generic rank.

There are seven species of *Echinochloa* in North America, two of them introduced from the Old World and a third introduced as well as native. Besides these species there are at least three in the Old World. Although the genus itself is well marked, some of the species are exceedingly variable and not easily distinguished from each other.

A variety of one species, *Echinochloa crusgalli edulis*, is occasionally cultivated in the United States for forage under the name of Japanese barnyard millet, and at one time was advertised by seedsmen as billion dollar grass.

The text figures are natural size.

DESCRIPTION OF THE GENUS AND SPECIES.

ECHINOCHLOA Beauv.

Echinochloa Beauv. Ess. Agrost. 53. *pl. 11. f. 11.* 1812. The type species is *Panicum crusgalli*, the one figured. Beauvois mentions several species in the text under *Panicum* and lists them under *Echinochloa* in the index.

DESCRIPTION.

Annual or perennial, coarse, often succulent grasses with linear flat blades and usually narrow panicles consisting of several spikelike racemes along a main axis. Spikelets plano-convex, often spiny-hispid, subsessile, in pairs or in irregular clusters crowded on one side of the panicle branches. First glume about half as long as the spikelet, pointed. Second glume and sterile lemma equal, stiffly hispidulous on the nerves, usually scabrous on the internerves, pointed, mucronate, or the glume short-awned, the lemma mucronate or awned, sometimes conspicuously so, inclosing a membranaceous palea and sometimes a staminate flower. Fruit plano-convex, the lemma and palea smooth and shining, abruptly acuminate-pointed, the lemma margins inrolled below, flat above, the apex of the palea not inclosed.

The genus differs from *Panicum* in the awned glumes (the first awnless in some species) and sterile lemma and the pointed fertile lemma. The awns are reduced to mucros or points in *E. colonum*, but the habit of the plant and the structure of the inflorescence show the species to be closely allied to the others.

KEY TO THE SPECIES.

Ligule a dense line of stiff yellowish hairs; plants perennial.
Fruit about 2.5 mm. long. Awn of sterile lemma less than 2 mm. long.
1. E. pyramidalis.
Fruit about 4 mm. long.
Awn of sterile lemma generally 5 to 10 mm. long; sterile floret staminate.
2. E. polystachya.
Awn of sterile lemma generally 4 to 5 cm. long; sterile floret neuter.
4. E. holciformis.
Ligule wanting, the ligular area sometimes pubescent; plants annual.
Racemes simple, rather distant, 1 to 2 cm. long; spikelets crowded in about 4 rows, the awn of the sterile lemma reduced to a short point; blades 3 to 6 mm. wide.
7. E. colonum.
Racemes more or less branched, usually more than 2 cm. long; spikelets irregularly crowded and fascicled, usually not arranged in rows, the awn of the sterile lemma variable; blades usually more than 5 mm. wide.
Fruit about 4 mm. long.....**3. E. oplismenoides.**
Fruit 2.5 to 3 mm. long.
Sheaths smooth; awns variable, but the panicle not a dense mass of long-awned spikelets.....**6. E. crusgalli.**
Sheaths, at least the lower, hispid or scabrous; panicle dense, the spikelets long-awned.....**5. E. walteri.**

1. Echinochloa pyramidalis (Lam.) Hitchc. & Chase.

Panicum pyramidale Lam. Tabl. Encycl. **1:** 171. 1791. "E Senegal. D. Roussillon."

FIG. 25.—*Echinochloa pyramidalis*. From *Duss* 3175, Guadeloupe.

Panicum spectabile var. *guadeloupense* Hack. Notizbl. Bot. Gart. Berlin **1:** 328. 1897. "Habitat in Guadeloupe in fossis et locis aquaticis prope faubourgs de la Pointe à Pitre: Duss n. 3176."

Echinochloa pyramidalis Hitchc & Chase, Contr. U. S. Nat. Herb. **18:** 345. 1917. Based on *Panicum pyramidale* Lam.

DESCRIPTION.

Plants perennial; stems erect, rather fleshy, 1.5 to 2.5 meters tall, glabrous; sheaths glabrous; ligule a dense row of stiff yellowish hairs 1 to 2 mm. long; blades 40 to 60 cm. long, 5 to 10 mm. wide, glabrous above, scabrous on the margins and on the nerves beneath; panicle 20 to 40 cm. long, the axis scabrous; racemes numerous, ascending, 2 to 7 cm. long, single or somewhat fascicled, distant below but overlapping, stiffly pilose at base and sparsely so along the scabrous or hispidulous rachis; spikelets about 3 mm. long, rather loosely arranged along the rachis, scabrous or slightly hispidulous on the

nerves, glabrous or nearly so on the internerves; sterile lemma mucronate or with an awn 1 to 2 mm. long; fruit about 2.5 mm. long, mucronate.

DISTRIBUTION.

In ditches, Guadeloupe, introduced from Africa.
LEEWARD ISLANDS: Guadeloupe, *Duss* 3175, 3176, 3920; *Hitchcock* 16412.

2. **Echinochloa polystachya** (H. B. K.) Hitchc.

Oplismenus polystachyus H. B. K. Nov. Gen. & Sp. **1**: 107. 1816. "Crescit in sylvis opacatis Orinocensibus prope Maypure et in radicibus montis Cumadamenari." The Humboldt collections have not been examined. The description applies well to glabrous specimens of *Echinochloa polystachya*. The ligule is described as "margo pilosus." This leaves little doubt as to the identity of the species.

Panicum spectabile Nees, Agrost. Bras. 262. 1829. "Habitat, uti videtur, in regno Angola Africae, a Lusitanis ob eximium, quod praebet, pabulum inde in Brasilium allatum, et variis per omne imperium locis cultum, e. g. ad Sebastianopolin, Soteropolin, Maragnanum, Pará." Nees further states, in regard to its introduction from Angola, "*Capim de Angola*, incolis, de cujus cultura conferatur: *Observaçoes á cerca do Capim de Angola, ultimamente trazido e cultivado aqui. Rio de Janeiro.* 1818." A specimen in the Munich Herbarium marked, "Capim de Angola. Martius. Iter Brasiliensis," is taken as the type. Dr. Otto Stapf informs me that he has no evidence that this species grows in Africa and that the statement by Nees that it was introduced from Angola appears to be an error.

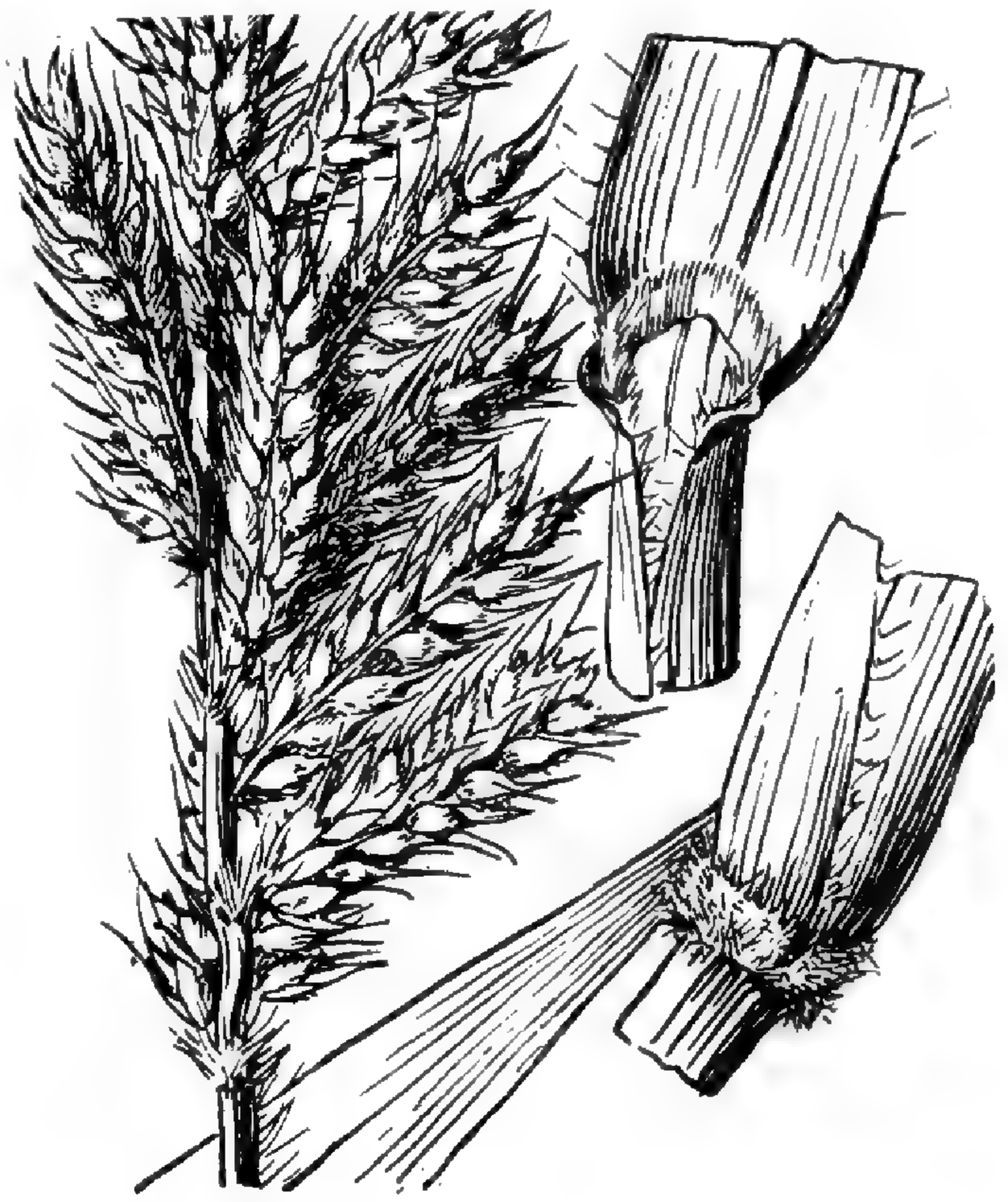

FIG. 26.—*Echin ochloa polystachya*. From *Pittier* 4383, Panama.

Echinochloa spectabilis Link, Hort. Berol. **2**: 209. 1833. Based on *Panicum spectabile* Nees.

Orthopogon hirsutus Spreng.; Steud. Nom. Bot. ed. 2. **2**: 234. 1841. A name only, given as synonym of *Panicum spectabile*.

Panicum phyllanthum Steud. Syn. Pl. Glum. **1**: 47. 1854. "Ex. hrbo. Deloche, lectum in Montevideo." The type has not been examined.

Panicum bonplandianum Steud. Syn. Pl. Glum. **1**: 48. 1854. Based on "*Oplismenus polystachyus* H. B."

DESCRIPTION.

Plants perennial, usually in colonies; culms coarse, 1 to 2 meters tall, from a long creeping rooting base, glabrous, the nodes densely hispid with appressed yellowish hairs; sheaths glabrous or papillose-hispid; ligule a dense line of stiff yellowish hairs as much as 4 mm. long; blades as much as 2.5 cm. wide, scabrous on the margins and upper surface; panicle 10 to 30 cm. long, rather dense, the axis angled, very scabrous; racemes ascending, the lower mostly 3 to 6 cm. long, densely hispid at base, the rachis very scabrous and more or less papillose-hispid; spikelets rather closely set, nearly sessile, about 5 mm. long; sterile floret staminate, the awn 2 to 10 mm. long; fruit rather soft, about 4 mm. long, extending into a point about 0.5 mm. long.

DISTRIBUTION.

Swamps and ditches near the coast, Mexico and the West Indies to Argentina.
San Luis Potosí: Cárdenas, *Hitchcock* 5737.
Tabasco: Laguna de Peralta, *Rovirosa* 315, González, *Rovirosa* 703.
Panama: Ormila, *Pittier* 4383.
Cuba: Habana, *Léon* 4168.
Jamaica: Savanna-la-Mar, *Hitchcock* 9868.
Santo Domingo: Sánchez, *Taylor* 66. Rincón, *Fuertes* 1419.
Porto Rico: Mayaguez, *Chase* 6290, 6319. Caguas, *Sintenis* 2543. Bayamon, *Hioram* 324 in part. Lares, *Chase* 6583.
Leeward Islands: Antigua, *Wullschlaegel* 635.
Windward Islands: Martinique, *Duss* 542.
Tobago: *Hitchcock* 10284; *Broadway* 4896.
Colombia: Santa Marta, *Smith* 108.
Dutch Guiana: Paramaribo, *Kuyper* in 1913.
Brazil: Paraná, *Dusen* 11461. Without locality, *Capanema* 5398.
Paraguay: Pilcomayo River, *Rojas* 76; *Morong* 1070.
Uruguay: San José, *Arechavaleta* 227.
Argentina: Buenos Aires, *Venturi* 6419.

3. **Echinochloa oplismenoides** (Fourn.) Hitchc.

Berchtoldia oplismenoides Fourn. Mex. Pl. **2**: 41. 1886. "Toluca, Lerma (Berl. n. 1140)." Berlandier's no. 1140 from Toluca, in the Paris Herbarium, is the type. Fournier has written the name upon the sheet. The specimen consists of three fragmentary culms with a few racemes of characteristic spikelets.

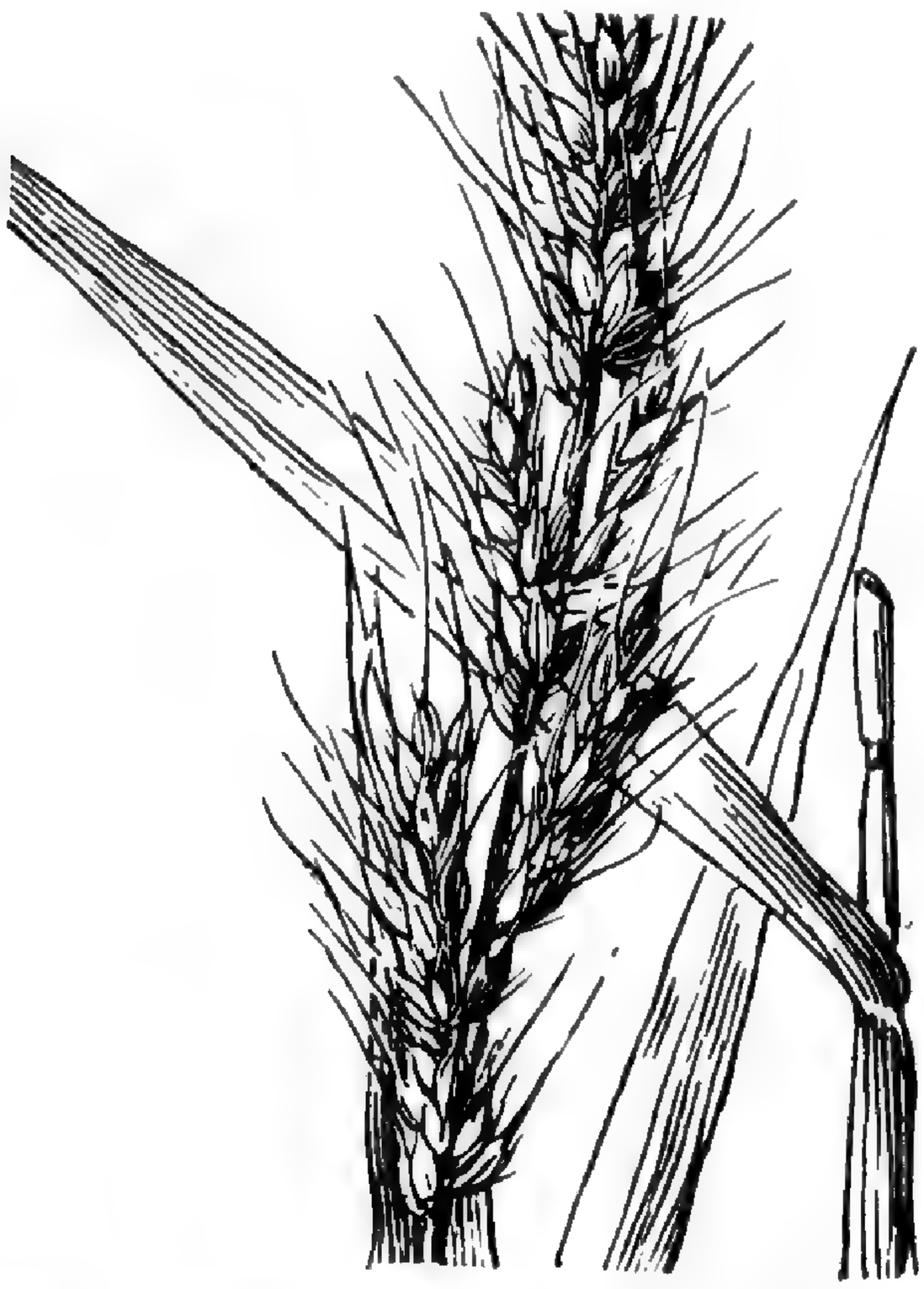

Fig. 27.—*Echinochloa oplismenoides*. From *Hitchcock* 7527 Mexico.

DESCRIPTION.

Plants annual; culms erect, as much as 1 meter tall, glabrous, the nodes glabrous or rarely appressed-hispidulous; sheaths glabrous; ligule wanting, or rarely a line of short hairs; blades mostly less than 1 cm. wide, scaberulous on the margins and upper surface; panicles narrow, usually not over 15 cm. long, the axis angled, scabrous; racemes appressed, the lower mostly 3 to 6 cm. long, the rachis angled, scabrous and more or less stiffly pilose, not hispid at base; spikelets rather densely set, 4 to 5 mm. long; first glume acutish, glabrous; second glume hispidulous on the nerves, acuminate; sterile lemma empty or with palea only, the awn usually about 1 cm. long, rarely as much as 3 cm. long; fruit about 4 mm. long, mucronate.

DISTRIBUTION.

Moist places, central Mexico.
Sonora: Cananea, *Ricketts* 2.
Chihuahua: Sierra Madre, *Pringle* 1404. Sánchez, *Hitchcock* 7696. Miñaca, *Hitchcock* 7758.
Durango: Durango, *Palmer* 253 in 1896; *Hitchcock* 7616. Otinapa, *Palmer* 333 in 1906.

ZACATECAS: Zacatecas, *Hitchcock* 7527.
AGUASCALIENTES: Aguascalientes, *Hitchcock* 7441, 7489.
MEXICO: Toluca, *Hitchcock* 6914.
MICHOACÁN: Zamora, *Pringle* 8480. Morelia, *Nicolás* in 1909.
PUEBLA: Puebla, *Arsène* 5444.

4. **Echinochloa holciformis** (H. B. K.) Chase.

Oplismenus holciformis H. B. K. Nov. Gen. & Sp. **1**: 107. 1816. "Crescit in humidis montanis prope Ciuapecuaro, alt. 970 hexap. (Regno Mexicano.)" A specimen from the type collection has been examined in the Willdenow Herbarium at Berlin. The label reads, "*Panicum holciforme.* Amer. merid. *Humboldt.*"

Orthopogon holciformis Spreng. Syst. Veg. **1**: 307. 1825. Based on *Oplismenus holciformis* H. B. K.

Panicum holciforme Steud. Syn. Pl. Glum. **1**: 48. 1854. Based on *Oplismenus holciformis* H. B. K.

Berchtoldia holciformis Fourn. Mex. Pl. **2**: 41. 1886. Based on *Oplismenus holciformis* H. B. K.

Echinochloa holciformis Chase, Proc. Biol. Soc. Washington **24**: 155. 1911. Based on *Oplismenus holciformis* H. B. K.

DESCRIPTION.

Plants perennial; culms erect, sometimes with a decumbent rooting base, stout, succulent, as much as 2 meters tall and 1.5 cm. thick at base, glabrous; sheaths glabrous; ligule a dense line of stiff hairs, long on the lower leaves, short on the upper leaves; blades mostly 8 to 15 mm. wide, scabrous on the margins and upper surface; panicle dense, or interrupted below, nodding, as much as 40 cm. long, the axis scabrous, densely hispid around the base of the branches; racemes appressed, single or fascicled, the lower as much as 10 cm. long, the rachis scabrous and hispid; spikelets rather closely arranged, nearly sessile, about 5 mm. long, fusiform, green or purple, only slightly convex on the rounded side; first glume acute or obtuse; second glume short-awned; sterile lemma empty, the awn as much as 5 cm. long; fruit elliptic, about 5 mm. long including the point, this about 1 mm. long.

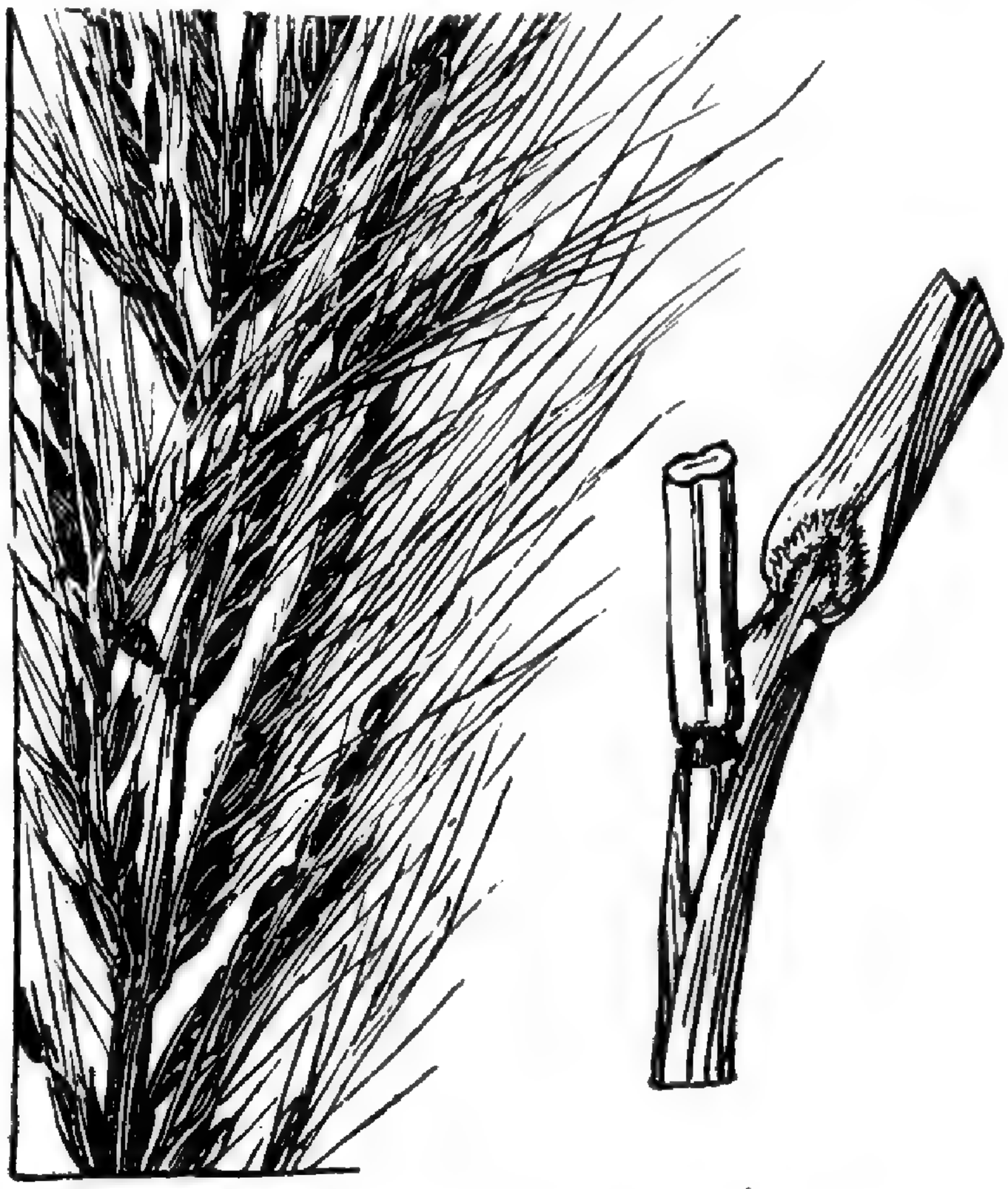

FIG. 28.—*Echinochloa holciformis.* From *Arsène* in 1909, Mexico.

DISTRIBUTION.

Moist places, often covering large areas in shallow water, central Mexico to Guatemala.
DURANGO: Durango, *Hitchcock* 7611; *Palmer* 253 in 1896.
JALISCO: Orosco, *Hitchcock* 7375.

GUANAJUATO: Acámbaro, *Hitchcock* 6946. Irapuato, *Hitchcock* 7393.
MICHOACÁN: Morelia, *Arsène* in 1909.
MEXICO: Valley of Mexico, *Pringle* 8622; *Berlandier* 730; *Karwinsky* in 1807. Tulu, *Holway* 9.
GUATEMALA: Estanzuela, *Heyde & Lux* 3911.

5. **Echinochloa walteri** (Pursh) Heller.

Panicum hirtellum Walt. Fl. Carol. 72. 1788. Not *Panicum hirtellum* L. 1759. Type locality, South Carolina, no definite station given. There are three specimens in Walter's herbarium at the British Museum.[1] One of these is the species described below under *Echinochloa walteri*. This specimen may be taken as the type, as this preserves the name in its usual application.

Panicum walteri Pursh, Fl. Amer. Sept. 66. 1814. The range is given as "Near the salt-water: Canada and New York." The species is described as having hispid sheaths. The name is founded on *P. hirtellum* Walt.

FIG. 29.—*Echinochloa walteri*. From *Chase* 1426, Illinois.

Panicum crusgalli var. *hispidum* Ell. Bot. S. C. & Ga. **1**: 114. 1816. Based on *P. hispidum* Muhl., in manuscript.

Panicum hispidum Muhl. Descr. Gram. 107. 1817. Not *Panicum hispidum* Forst. 1786. "Habitat in Carolina, Delaware, et Nov. Ebor." *Panicum hirtellum* Walt. is cited as a synonym.

Panicum longisetum Torr. Amer. Journ. Sci. **4**: 58. 1822. Not *Panicum longisetum* Poir. 1816. "On the banks of the Fox River," Wisconsin. The type, labeled "Cass's Exped. Capt. Douglass," is in the Torrey Herbarium. The sheaths are glabrous, but only the upper part of the plant is shown.

Orthopogon hispidus Spreng. Syst. Veg. **1**: 307. 1825. Based on *Panicum hispidum* Muhl.

Oplismenus longisetus Kunth, Rév. Gram. **1**: 45. 1829. Based on "*Panicum longisetum* Torrey."

Echinochloa walteri Heller, Cat. N. Amer. Pl. ed. 2. 21. 1900. Based on *Panicum walteri* Pursh.

Echinochloa longiaristata Nash in Small, Fl. Southeast. U. S. 84. 1903. "In wet ground, South Carolina to Louisiana." The type in the Torrey Herbarium was collected in Louisiana by Hale. The sheaths are glabrous, but only the upper part of the plant is shown.

DESCRIPTION.

Plants annual; stems erect, often succulent, often rooting at the lower nodes when growing in mud or water, 1 to 2 meters high, as much as 2.5 cm. thick at base, glabrous; sheaths papillose-hispid, or papillose only, sometimes only the lower sheaths hispid or the hairs confined to the marginal region, or sometimes scabrous only, or rarely glabrous, the collar more or less pubescent; ligule wanting, the ligular area often pubescent; blades usually 10 to 15 mm. wide, sometimes as much as 3 cm. wide, mostly scabrous on both surfaces; panicle large and dense, as much as 30 cm. long,

[1] See Hitchcock, The Identification of Walter's grasses. Rep. Mo. Bot. Gard. **16**: 34. 1905.

erect or nodding, the axis very scabrous, more or less papillose-hispid on the angles; racemes appressed or ascending, single or, in the larger plants, usually fascicled, approximate or the lower somewhat distant, sometimes branched, as much as 10 cm. long, the rachis hispidulous and more or less papillose-hispid, especially at base; spikelets closely arranged, several on short branches of the raceme, mostly long-awned, often purple, about 3 mm. long; sterile floret with a palea, neuter, the awn usually 1 to 2 cm. long, sometimes longer, more rarely reduced to a short point; fruit about 3 mm. long, fusiform, about 1 mm. wide, narrower and more fusiform than in *E. crusgalli*.

DISTRIBUTION.

Coastal Plain, Massachusetts to Florida and Texas; also Michigan to Illinois; Cuba.

MASSACHUSETTS: West Barnstable, *Knowlton* in 1911.

NEW JERSEY: Point Pleasant, *Pollard* in 1897. Little Silver, *Scribner* in 1891. Atlantic City, *Scribner* in 1895. Clifton, *Nash* in 1889. Port Norris, *Holmes* 399.

PENNSYLVANIA: Philadelphia, *Smith*.

OHIO: St. Marys, *Wetzstein* 6905; *Kneuck. Gram. Exs.* 75. Sandusky, *Moseley* in 1898.

INDIANA: Little Chapman Lake, *Deam* 21975. Blue Lake, *Deam* 21700. Wilson, *Hill* in 1898.

ILLINOIS: Peoria, *Brendel*. St. Clair County, *Eggert* 232. Chicago, *Chase* 1426.

MICHIGAN: Port Huron, *Dodge* 145. Detroit, *Farwell* in 1901.

WISCONSIN: Sauk City, *Luders* in 1884.

DELAWARE: Collins Beach, *Commons* in 1865. Wilmington, *Commons* in 1897.

MARYLAND: Chesapeake Beach, *Hitchcock* 2388. Little Gunpowder River, *Shull* 308.

VIRGINIA: Virginia Beach, *Williams* 3101; *Hitchcock* in 1902.

NORTH CAROLINA: Wilmington, *Amer. Gr. Nat. Herb.* 431. Elizabeth City, *Boettcher* 290.

SOUTH CAROLINA: Aiken, *Ravenel* in 1869. Georgetown, *Alexander* 167. Orangeburg, *Hitchcock* in 1905.

GEORGIA: Americus, *Harper* 539.

FLORIDA: Orange County, *Fredholm* 5420, 5455. Cedar Key, *Combs* 787, 797. Tallahassee, *Kearney* 72. Duval County, *Fredholm* 245. Jacksonville, *Hitchcock* in 1900; *Combs* 21; *Curtiss* 5023, 5091. Gainesville, *Combs* 747; *Chase* 4233. Sanibel Island, *Hitchcock* in 1900. Hillsborough County, *Fredholm* 6342. Pablo Beach, *Combs* 48. Homosassa, *Combs* 962. Bartow, *Combs* 1199. Apalachicola, *Kearney* 100; *Biltmore Herb.* 809b. Lake City, *Combs* 143; *Hitchcock* 2550. Grasmere, *Combs* 1060. Citrus County, *Hitchcock* 2549. Marion County, *Hitchcock* 2548. Miami, *Hitchcock* in 1903. St. Vincent Island, *McAtee* 1689B. Palma Sola, *Tracy* 7036. Monticello, *Combs* 311.

KENTUCKY: Reelfoot Lake, *Alexander* 307.

MISSISSIPPI: Cat Island, *Tracy & Lloyd* 442.

LOUISIANA: Alexandria, *Hale* in 1840. Houma, *Wurzlow* in 1913. Marksville, *McAtee* 2210. Pointe a la Hache, *Langlois* in 1885. New Orleans, *Waite* in 1885. Lake Charles, *Allison* 101.

TEXAS: Houston, *Thurow* in 1898. Galveston, *Hitchcock* in 1903. Western Texas, *Wright* 795. Uvalde, *Palmer* 1340 in 1880.

CUBA: Hanábana, *Wright* 3879 in part.

6. **Echinochloa crusgalli** (L.) Beauv.

Panicum crusgalli L. Sp. Pl. 56. 1753. "Habitat in Europae, Virginiae cultis." The type of *Panicum crusgalli* was discussed in an earlier paper.[1] The only specimen in the Linnaean Herbarium upon which Linnaeus has written the name is a sheet

[1] Hitchcock, Types of American grasses. Contr. U. S. Nat. Herb. **12**: 117. 1908.

from Kalm collected in Canada. This specimen was, in the paper mentioned, considered to be the type. A reconsideration of the subject leads me to the conclusion that the name was applied to a concept rather than to a specimen or specimens and that the basis of this concept was the species as generally known in Europe. The Kalm specimen is about the same form as the type of *Panicum muricatum* Michx. The application of the name *crusgalli* is not altered by the elimination of this Kalm specimen as a type. In the first edition of the Species Plantarum Linnaeus describes *Panicum crusgalli* and also a variety β, and gives as the habitat "in Europae, Virginiae cultis." This treatment is followed in the second edition, where he states that "Varietas β. aristis decies glumis longioribus manifeste a communi planta cui vix sesquilongiores aristae, differt." In my remarks on types of American grasses,[1] I showed that the basis of variety β was a specimen of *Echinochloa walteri* from Gronovius (*Clayton* 579). From Linnaeus's note concerning variety β, quoted above, it would appear that the common form, as understood by Linnaeus, had awns about 5 mm. long.

Panicum cruscorvi L. Syst. Nat. ed. 10. **2**: 870. 1759. No locality is given. In a later work[2] the habitat is given as "in Indiis." This is usually referred to *Panicum crusgalli*, in works on the Asiatic flora.

Milium crusgalli Moench, Meth. Pl. 202. 1794. Based on *Panicum crusgalli* L.

Panicum grossum Salisb. Prodr. Stirp. 18. 1796. Based on *Panicum crusgalli* L. The text of the Prodromus is a mere list. This species appears as follows: "Grossum. 6. P. [Panicum] Crus Galli Linn. Sp. Pl. ed. 2. p. 83."

Panicum muricatum Michx. Fl. Bor. Amer. **1**: 47. 1803. Not *Panicum muricatum* Retz. 1786. "Hab. in Canada ad ripas lacus Champlain et ad lacum Ontario." The type, labeled "Lac. Champlain," was examined at the Paris Herbarium.[3] This form is maintained as a distinct species by Fernald, as indicated below under *Echinochloa muricata*. The trichomes on the second glume and sterile lemma are coarse and arise from large papillae.

Echinochloa crusgalli Beauv. Ess. Agrost. 53, 161. 1812. Based on *Panicum crusgalli* L.

Panicum crusgalli var. *aristatum* Pursh, Fl. Amer. Sept. 66. 1814. No locality given, but probably from eastern United States. The long awned form.

Panicum pungens Poir. in Lam. Encycl. Suppl. **4**: 273. 1816. Based on *Panicum muricatum* Michx. "non Lam. Dict."

Setaria muricata Roem. & Schult. Syst. Veg. **2**: 495. 1817. Based on *Panicum muricatum* Michx.

Echinochloa crusgalli var. *aristata* S. F. Gray, Nat. Arr. Brit. Pl. **2**: 158. 1821. Described from Great Britain, no definite locality given. The long-awned form.

Oplismenus crusgalli Dum. Obs. Gram. Belg. 138. 1823. Based on *Panicum crusgalli* L.

Orthopogon crusgalli Spreng. Syst. Veg. **1**: 307. 1825. Based on *Panicum crusgalli* L.

Oplismenus muricatus Kunth, Rév. Gram. **1**: 44. 1829. Based on "*Panicum muricatum* Mich."

Echinochloa muricata Fernald, Rhodora **17**: 106. 1915. Based on *Panicum muricatum* Michx. Fernald distinguishes *Echinochloa muricata* from *E. crusgalli* by the stiff hairs arising from papillae upon the spikelets and maintains that the former is a native of the United States while the latter, in which the hairs lack the papillose base, is introduced in this country. I have been unable to distinguish *E. muricata* on this basis, as both forms occur in Europe and the two appear to me to intergrade.

There are other synonyms in works on the floras of the Old World.

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[1] Contr. U. S. Nat. Herb. **12**: 117. 1908.

[2] Sp. Pl. ed. 2. 84. 1762.

[3] Contr U. S. Nat. Herb. **12**: 146. 1908.

FIG. 30.—*Echinochloa crusgalli*. From *Somes* 3725, Iowa.

DESCRIPTION.

Plants annual; culms erect or sometimes decumbent at base, as much as 1 meter or even 1.5 meters tall, glabrous; sheaths glabrous; ligule wanting, the ligular area sometimes slightly pubescent; blades 5 to 15 mm. wide, scabrous on the margins, sometimes on the upper surface; panicles erect (or nodding), 10 to 20 cm. long, the axis scabrous; racemes spreading, ascending, or appressed, the lower somewhat distant, as much as 10 cm. long, sometimes branched, the upper approximate, shorter, the rachis scabrous, hispid, especially at the base; spikelets crowded, about 3 mm. long, excluding the awns, strongly hispid or papillose-hispid on the nerves, hispidulous on the internerves; sterile lemma with a well-developed palea, neuter, the awn variable in length, mostly 5 to 10 mm. long on at least a part of the spikelets, sometimes as much as 3 cm. long; fruit elliptic, turgid, narrowed into a cusp or point, 2.5 to 3 mm. long, whitish or brownish.

In America the species may be divided into three geographical races. These are fairly distinct over a certain range, but overlap and intergrade to such an extent that they can not be recognized as distinct species. The three races were originally described as *Panicum crusgalli* L., *Oplismenus crus-pavonis* H. B. K., and *O. zelayensis* H. B. K., respectively. The first is a native of the Old World and also of the eastern United States. The second is found in Brazil and extends north into Mexico and the West Indies. The third has its center of distribution on the Mexican plateau and extends into the southwestern United States. However, there are many specimens in our herbaria that can not be definitely assigned to any one of these forms. Hence in the distribution given under each race the placing of some of the specimens under a given subspecies is arbitrary.

European botanists generally distinguish two forms of the first race, *Panicum crusgalli*, a long-awned and a short-awned, and recent works generally apply the varietal names, *longiaristata* to the first, and *breviaristata* to the second. Ascherson and Graebner,[1] whose recent work is representative for Europe, include the two forms under *Panicum* as *P. crusgalli longiaristatum* Doell[2] and *P. crusgalli breviaristatum* Doell.[2]

Pursh[3] first distinguished the forms in America as *Panicum crusgalli* var. *aristatum* and *P. crusgalli* var. *mite*.

The robust form with large compound panicle of short-awned or merely pointed spikelets may look very distinct, but the intergrades are so numerous that it can scarcely receive recognition as a variety. For the sake of convenience it is here segregated as a variety and the specimens of *Echinochloa crusgalli* are more or less arbitrarily assigned to the two forms, the awned under *Echinochloa crusgalli*, the nearly awnless under *E. crusgalli mitis*.

A third form of the first race, originally described as *Panicum frumentaceum* Roxb., is rather more distinct because, being cultivated, the slight differences are perpetuated.

DISTRIBUTION.

Moist open ground, ditches, cultivated fields, and waste places, New Brunswick to Washington, south to Florida and California; warmer parts of the Eastern Hemisphere. The following specimens are referred to the typical or awned form; some of them, however, approach variety *mitis*, but at least a part of the spikelets have awns as much as 3 mm. long. Commonly known as barnyard grass.

NEW BRUNSWICK: Shediac Cape, *Hubbard* 755, 763.

QUEBEC: Oka, *Victorin* 3022.

ONTARIO: Amherstburgh, *Macoun* 26319. Kingston, *Fowler* in 1897 and 1905. Galt, *Herriot* in 1908. Larma, *Dodge* 129.

MANITOBA: Branchon, *Macoun* 13226.

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[1] Syn. Mitteleur. Fl. **2**: 69. 1898.

[2] Fl. Bad. **1**: 232. 1857.

[3] Fl. Amer. Sept. 66. 1814.

MAINE: Orono, *Briggs* 6; *Harvey* 1200. Manchester, *Scribner* in 1873. Cumberland, *Chamberlain* 153. Westbrook, *Ricker* 679.
NEW HAMPSHIRE: Shelburne, *Deane* in 1915.
VERMONT: Manchester, *Day* 272. Rutland, *Kirk* 1024.
MASSACHUSETTS: Nantucket, *F. N. Vasey* in 1897. Winchendon, *Pollard* in 1895. Stoughton, *Blake* 4639. Dennis, *Weatherby* 3827.
CONNECTICUT: Stratford, *Eames* in 1894. South Glastonbury, *Wilson* 1259.
RHODE ISLAND: Providence, *Battey*.
NEW YORK: Oxford, *Coville* in 1884. Clove, *Standley & Bollman* 12166, 12189. Oneida Lake, *Haberer* 1259a. Greenport, *Latham* 318.
NEW JERSEY: New Durham, *Kearney* in 1894. Camden, *Parker*. Califon, *Fisher* in 1901. Atlantic City, *Scribner* in 1895.
PENNSYLVANIA: Easton, *Porter* in 1895. Harrisburg, *Small* in 1888.
OHIO: Olena, *Jennings* 6759. Albion, *Ashcroft* in 1897.
INDIANA: Lafayette, *Dorner* 51. Pennville, *Deam* 23815. Middlebury, *Deam* 23967. Spencer, *Deam* 23878. Pimento, *Deam* 22195.
ILLINOIS: Chicago, *Nelson* in 1898; *Umbach* in 1898. Emington, *Wilcox* 120. Wady Petra, *V. H. Chase* 95, 1163.
MICHIGAN: Alma, *Davis* in 1895. Detroit, *Farwell* in 1902. Port Huron, *Dodge* 110.
WISCONSIN: Camp Douglas, *Mearns* 772. Madison, *Churchill* in 1893. Milwaukee, *Chase* 1954.
MINNESOTA: Duluth, *Hitchcock* 5087.
NORTH DAKOTA: Fargo, *Waldron & Manns* in 1901. Churchs Ferry, *Brannon* 56. Leeds, *Lunell* in 1901.
SOUTH DAKOTA: Grindstone Buttes, *Griffiths* 750. Frankfort, *Griffiths* 58b. Deep Creek, *Griffiths* 315.
IOWA: Moscow, *Somes* 3471. Manchester, *Ball* 1006. Ledyard, *Pammel* 886. Mid River, *Somes* 3725. Ames, *Ball* 31. Mount Pleasant, *Ball* 19. Fayette County, *Fink* 327.
NEBRASKA: Rat Lake, *Thomson* 60. Weeping Water, *Williams* 3011, 3012. Ewing, *Bates* 1124, 1125.
MISSOURI: Clarksville, *Davis* 1119. Aberdeen, *Davis* 945. La Grange, *Davis* 1060. Hannibal, *Davis* 1043. Springfield, *Standley* 8485. St. Louis, *Eggert* 231.
KANSAS: Osborne City, *Shear* 229. Riley County, *Norton* 574, 884, 884b; *Kellerman* 51.
DELAWARE: Mount Cuba, *Commons* 221.
MARYLAND: Mattawoman Creek, *Tidestrom* 7210. Chesapeake Beach, *Chase* 6995. Patuxent River, *Shull* 277. Takoma Park, *Chase* 7532.
DISTRICT OF COLUMBIA: *Pollard* 520, 683; *Topping* in 1895; *Ward* in 1876; *Steele* in 1896.
VIRGINIA: Four-mile Run, *Chase* 2670. Marion, *Small* in 1892. Princess Anne County, *Kearney* 2187. Portsmouth, *Noyes* 71. Glen Carlyn, *Dewey* 322. Arlington, *Amer. Gr. Nat. Herb.* 427.
WEST VIRGINIA: Sweet Springs, *Steele* 210.
NORTH CAROLINA: Biltmore, *Biltmore Herb.* 809a. Waynesville, *Standley* 5593. Swayney, *Mooney* in 1913.
SOUTH CAROLINA: Oconee County, *Anderson* 1533. Jacksonboro, *Metcalf* in 1905.
GEORGIA: Lafayette, *Harper* 343.
FLORIDA: Fort Myers, *J. P. Standley* 357a; *Standley* 12960; *Hitchcock* 476. Manatee, *Tracy* 7754. Orange County, *Fredholm* 5455. Lake City, *Bitting* 15, 804, 1031, 1036. Eustis, *Nash* 979. Miami, *Hitchcock* 638, 698, 716; *Pollard & Collins* 249. Jensen, *Hitchcock* 746. New Smyrna, *Curtiss* 5823. Bartow, *Combs* 1236. Homosassa, *Combs* 923. Grasmere, *Combs* 1167. Dunnellon, *Combs* 913. Palm Beach, *Hitchcock* 2561. Hillsborough County, *Fredholm* 6342, 6390. Orange County, *Fredholm* 5455.

TENNESSEE: Knoxville, *Ruth* 62. Wolf Creek Station, *Kearney* in 1897.
MISSISSIPPI: Starkville, *Tracy* in 1889. Waynesboro, *Kearney* 197.
LOUISIANA: Houma, *Wurzlow*. Crowley, *Webb* in 1913. Breton Island, *Tracy & Lloyd* 480. Calhoun, *Ball* 72. Cameron, *McAtee* 1902.
TEXAS: Guadalupe River, *Groth* 179. Houston, *Fisher* 199. Del Rio, *Hitchcock* 13632. Big Spring, *Hitchcock* 13399. Madison County, *Dixon* 443. Clarksville, *Plank* 12. El Paso, *Hitchcock* 13340. San Antonio, *Amer. Gr. Nat. Herb.* 428. Brownsville, *Hitchcock* in 1904. Western Texas, *Wright* 974.
OKLAHOMA: False Ouachita, *Palmer* 378, 379a. Lincoln County, *Blankinship* in 1895.
MONTANA: Ulm, *Williams* 591.
WYOMING: Little Missouri Buttes, *Griffiths* 599. Newcastle, *Griffiths* 679.
IDAHO: Boise, *Clark* 308. St. Anthony, *Merrill* 55. Pocatello, *Hitchcock* 1841. New Plymouth, *Macbride* 713. Salmon, *Henderson* 3937. Forest, *Brown* 20.
WASHINGTON: Waitsburg, *Horner* 527. Alma, *Elmer* 530. Prosser, *Cotton* 641, 892. Klickitat County, *Suksdorf* 2329. Bingen, *Suksdorf* 2639.
OREGON: Portland, *Suksdorf* 1742. Paisley, *Elder* 22. Wasco County, *Leiberg* 866. Clarks Creek, *Sheldon* 8863. Klamath Falls, *Hitchcock* 2961. Hood River, *Hitchcock* in 1903. Southeastern Oregon, *Griffiths & Morris* 867, 892, 894.
COLORADO: Grand Junction, *Hitchcock* 2197. Canon City, *Shear* 962. Meadow Park. *Shear* 602. Durango, *Tweedy* 377. Alamosa, *Shear* 863.
UTAH: Ephraim, *Tidestrom* 2483.
NEVADA: Battle Mountain, *Hitchcock* 10598. Leonard Creek Ranch, *Griffiths & Morris* 352. Wadsworth, *Griffiths & Hunter* 549. Big Creek, *Griffiths & Morris*, 186.
NEW MEXICO: Cedar Hill, *Standley* 7937. Without locality, *Wright* 2089.
ARIZONA: Winslow, *Griffiths* 5018. Walnut Canyon, *MacDougal* 353. Prescott, *Hitchcock* 13192, 13193; *Amer. Gr. Nat. Herb.* 429.
CALIFORNIA: Biggs, *Johnson* 149. Van Sickle Island, *Kennedy* in 1914. Wrights, *Elmer* 5008. Oroville, *Brown* 114. Visalia, *Coville & Funston* 1277. Sutler Creek, *Braunton* 1130. Stockton, *Davy* 1180. Guerneville, *Davy* in 1896. Napa County, *Bolander* 2419. Amador, *Hansen* 820. Stuarts, *Yates* 515. Yreka, *Butler* 865. Eureka, *Tracy* 4634.
URUGUAY: Montevideo, *Arechavaleta*.

Echinochloa crusgalli mitis (Pursh) Peterm.

Panicum crusgalli var. *mite* Pursh, Fl. Amer. Sept. 66. 1814. Described from eastern United States, no definite locality given. The short-awned or awnless form.

Panicum crusgalli var. *purpureum* Pursh, Fl. Amer. Sept. 66. 1814. A form of the last with purple spikelets.

Panicum crusgalli var. *muticum* Ell. Bot. S. C. & Ga. **1**: 114. 1816. Described from South Carolina or Georgia, but no definite locality given. Spikelets acuminate. The awnless form common in the eastern states.

Echinochloa crusgalli var. *mitis* Peterm. Fl. Lips. 82. 1838. Based on *Panicum crusgalli* var. *mite* Pursh.

Panicum scindens Nees; Steud. Syn. Pl. Glum. **1**: 47. 1854. "St. Louis." The type, in the Berlin Herbarium, was collected by Drummond in 1831. It is the nearly awnless form with rather small panicles, the lower racemes spreading.

DESCRIPTION.

Differs from the typical form in having the spikelets awnless or nearly so, the awns being less than 3 mm. long. In the Southwest this form passes into *E. crusgalli zelayensis*. A specimen from San Antonio, Texas, has scabrous sheaths (*Hitchcock* 5141).

DISTRIBUTION.

Moist places, Massachusetts to British Columbia, south to Florida, California, and northern Mexico.

ONTARIO: Toronto, *Macoun* 26318. Galt, *Herriot* 73, 82.

BRITISH COLUMBIA: Agassiz, *Macoun* 4.

MASSACHUSETTS: Pittsfield, *Harrison* 21.

NEW YORK: South Bay, *Haberer* 3303. Staten Island, *Kearney* in 1894.

PENNSYLVANIA: Philadelphia, *Smith*.

OHIO: Oberlin, *Ricksecker* in 1894.

MICHIGAN: Detroit, *Farwell* in 1902. Marquette, *Farwell* in 1902.

MINNESOTA: Fort Snelling, *Mearns* 39.

NORTH DAKOTA: Fargo, *Wright* 1864. Leeds, *Lunell* in 1915.

SOUTH DAKOTA: Huron, *Griffiths* 14, 771, 773. Bellefourche, *Griffiths* 373. Frankfort, *Griffiths* 58a. Aberdeen, *Griffiths* 108. Pierre, *Griffiths* 763. Jamesville, *Bruce* 5. Sonoma, *Griffiths* 351. Hot Springs, *Rydberg* 1101.

IOWA: Kossuth County, *Pammel & Cratty* 791.

NEBRASKA: Whitman, *Rydberg* 1643. Rat Lake, *Thomson* 159. Blue Lake, *Thomson* 310. South Cody Lake, *Thomson* 249. Chelsea, *Clements* 2984. Mullen, *Rydberg* 1590. Forest Station, *Hitchcock* 11067.

MISSOURI: Springfield, *Standley* 1557, 9047, 9764.

KANSAS: Hutchinson, *Smyth* 8. Riley County, *Norton* 884a. Osborne, *Shear* 169. Grant County, *Hitchcock* 573. Syracuse, *Thompson* 131.

DELAWARE: Slaughter Beach, *Commons* 222.

DISTRICT OF COLUMBIA: *Sudworth* in 1890.

NORTH CAROLINA: Magnetic City, *Wetherby* 20.

GEORGIA: Macon, *McCarthy* in 1888.

FLORIDA: Palm Beach, *Hitchcock* 2562.

MISSISSIPPI: Woodville, *Phares* in 1878. Starkville, *Kearney* 7. Panola County, *Eggers* 124.

LOUISIANA: Burnside, *Combs* 1418. Alexandria, *Ball* 176; *Hale*. Marksville, *McAtee* 2186.

TEXAS: San Antonio, *Hitchcock* 5323. El Paso, *Hitchcock* 13331; *Barlow* in 1911. Del Rio, *Hitchcock* 13644. Brownsville, *Hitchcock* 5422. Bastrop, *Plank* 36. Riogrande, *Griffiths* 6470. College Station, *Hitchcock* in 1903. Western Texas, *Wright* 796.

WYOMING: Ten Sleep, *Williams* 2816. Cumins, *Nelson* 1500. Newcastle, *Griffiths* 679. Platte Canyon, *Nelson* 2748. Buffalo, *Chase* 5266. Devils Tower, *Griffiths* 520. Uva, *Nelson* 8567.

WASHINGTON: Bingen, *Suksdorf* 2639, 2826.

OREGON: John Day Ferry, *Leiberg* 872. Portland, *Suksdorf* 1682. Southeastern Oregon, *Griffiths & Morris* 657.

COLORADO: Rocky Ford, *Griffiths* 3310. Golden, *Rydberg* 2503. Durango, *Shear* 1255. Dry Creek, *Nelson* 8207.

FIG. 31.—*Echinochloa crusgalli mitis*. From *Pammel & Cratty* 791, Iowa.

UTAH: Ephraim, *Hitchcock* 10968. Provo, *Tidestrom* 1740. Cainville, *Jones* 5696. Vérmilion, *Jones* 5845. Gunnison, *Tidestrom* 2952; *Ward* 678.
NEVADA: Truckee Valley, *Bailey* 1351.
NEW MEXICO: Dog Spring, *Mearns* 2409. Strauss, *Stearns* 402. Roswell, *Griffiths* 5729. Shiprock Agency, *Standley* 7218. Mesilla, *Wooton* 36; *Standley* 422; *Hitchcock* 3817. White Mountains, *Wooton & Standley* 3578. Mangas Springs, *Metcalfe* 728. Albuquerque, *Harward* 2, 3. Artesia, *Hitchcock* 13440. Kingston, *Metcalfe* 1351. Deming, *Hitchcock* 3759. Carlsbad, *Hitchcock* 13491.
ARIZONA: Fort Huachuca, *Wilcox* 2547. Moki Reservation, *Hough* 108. Prescott, *Fernow* in 1896. Chiricahua Mountains, *Blumer* 1782. Horseshoe Bend, *Palmer* 749. Tucson, *Toumey* 780. Patagonia, *Hitchcock* 3666.
CALIFORNIA: Oro Fino, *Butler* 490. Piedmont, *Davy* in 1897. Pine Grove, *Hansen* 601. Redding, *Smith* 745. San Bernardino, *Parish* in 1890.
SONORA: Hermosillo, *Hitchcock* 3599.
CHIHUAHUA: Pacheco, *Nelson* 6244. Southwestern Chihuahua, *Palmer* 18 in 1885.
DURANGO: Durango, *Palmer* 466 in 1896.
COAHUILA: Saltillo, *Hitchcock* 5606.

FIG. 32.—*Echinochloa crusgalli edulis*. From *Piper* in 1912 Texas.

Echinochloa crusgalli edulis Hitchc.

Panicum frumentaceum Roxb. Fl Ind. **1**: 307. 1820. Not *Panicum frumentaceum* Salisb. 1796. "This I have only found in a state of cultivation." Described from India, but no definite locality given.

Echinochloa frumentacea Link, Hort. Berol. **1**: 204. 1827. Based on *Panicum frumentaceum* Roxb.

Oplismenus frumentaceus Kunth, Rév. Gram. **1**: 415. 1829. Based on *Panicum frumentaceum* Roxb.

Echinochloa crusgalli frumentacea W. F. Wight, Suppl. Cent. Dict. 810. 1909. Without description, but presumably based on *Panicum frumentaceum* Roxb.

Echinochloa crusgalli edulis Hitchc., U. S. Dept. Agr. Bull. **772**: 238. 1920.

DESCRIPTION.

Differs from the typical form in having dense panicles, the racemes thick, appressed, incurved; spikelets awnless, mostly purple; fruits pale, usually exposed before maturity, contrasting with the purple glumes.

In the United States this is sometimes cultivated as a forage grass under the name Japanese barnyard millet. For a time it was exploited under the name billion-dollar grass. In India the seed is used for human food.

DISTRIBUTION.

Escaped from cultivation in several localities in the eastern United States.
NEW HAMPSHIRE: Shelburne, *Amer. Gr. Nat. Herb.* 430.
VERMONT: Burlington, *Hitchcock* 16028.

CONNECTICUT: Salisbury, *Bissell* in 1906.
NEW JERSEY: Califon, *Fisher* in 1901.
ILLINOIS: Catlin, *Lansing* 3507.
MICHIGAN: Cass County, *Darlington* in 1917.
DISTRICT OF COLUMBIA: *Ball* in 1900.
NORTH CAROLINA: West Raleigh, *Coit* 1294.
ALABAMA: Tuskegee, *Hitchcock* in 1904.
TEXAS: Eastern Texas, *Piper* in 1910.

Echinochloa crusgalli zelayensis (H. B. K.) Hitchc.

Oplismenus zelayensis H. B. K. Nov. Gen. & Sp. **1:** 108. 1816. "Crescit in alta planitie montana regni Mexicani, prope Zelaya, Queretaro et Patzcuaro, in humidis." The specimen from Pátzcuaro is in the Paris Herbarium. This is the form, common in Mexico and southwestern United States, in which the panicle is erect and simple, the racemes short and appressed, and the spikelets nearly awnless.

Echinochloa zelayensis Schult. Mant. **2:** 269. 1824. Based on *Oplismenus zelayensis* H. B. K.

Panicum zelayense Steud. Nom. Bot. ed. 2. **2:** 265. 1841. Based on *Oplismenus zelayensis* H. B. K.

Panicum crus-pici Willd.; Doell in Mart. Fl. Bras. **2**^{2}**:** 143. 1877. A herbarium name mentioned as a form of *Panicum crusgalli*. There are two sheets so named in the Willdenow Herbarium, one with short-awned and one with long-awned spikelets. The former is the specimen referred to by Doell.

Echinochloa crusgalli zelayensis Hitchc. U. S. Dept. Agr. Bull. **772:** 238. 1920.

FIG. 33.—*Echinochloa crusgalli zelayensis*. From *Mearns* 744, Mexico.

DESCRIPTION.

Differs from *E. crusgalli mitis* in having mostly simple, more or less appressed racemes, the spikelets less strongly hispid, not papillose, usually green.

DISTRIBUTION.

Moist, often alkaline places, Oklahoma to Oregon, south through Mexico to Colombia and Argentina.
TEXAS: El Paso, *Chase* 5888; *Havard* in 1882; *Hitchcock* 13329, 13330. Big Spring, *Tracy* 8291. Houston, *Hall* 836. Hockley, *Thurow* in 1898. Cypress, *Thurow* in 1898. Bastrop, *Plank* 38. Richmond, *Plank* 9. Chillicothe, *Ball* 973. Seguin, *Plank* 98. Eagle Pass, *Havard* 82.
OKLAHOMA: Without locality, *Stevens* 1178.
OREGON: Southeastern Oregon, *Griffiths & Morris* 893. Portland, *Sheldon* 10929.
COLORADO: Golden, *Shear* 753, 2502.
UTAH: Ogden, *Hitchcock* 10879. Salt Lake City, *Jones* in 1879. Green River, *Tracy* in 1887.
NEW MEXICO: Mesilla, *Hitchcock* 3828. Cloudcroft, *Hitchcock* 13298. Carlsbad, *Hitchcock* 13492. Grant County, *Blumer* 132. Pecos, *Standley* 5016. Ojo Caliente, *Wooton* 2968. Las Cruces, *Wooton* 1072; *Hitchcock* in 1903. Albuquerque, *Jones* 4125. Farmington, *Standley* 7030. Cimarron Canyon, *Griffiths* 5552. Cedar Hill, *Standley* 7936. Without locality, *Wright* 2088.

ARIZONA: San Bernardino Ranch, *Mearns* 744. San Pedro River, *Mearns* 1120. Carrizo Mountains, *Standley* 7494. Winslow, *Griffiths* 5035. Fort Verde, *MacDougal* 614. Opposite Black Point (California), *Jepson* in 1912. Prescott, *Hitchcock* 13180. Benson, *Griffiths* 1993. Papago Reservation, *Griffiths* 1651. Fairbank, *Griffiths* 1970. Tucson, *Griffiths* 1616.

CALIFORNIA: Ione, *Braunton* 1241. Lake Tahoe, *Hitchcock* in 1901. Threerivers, *Jepson* 4717. Rockwood, *Parish* 8340. Fort Yuma, *Parish* 8233. Imperial Valley, *Parish* 8085; *Wales* 13. Kern County, *Hilgard* in 1895. Merced, *Hitchcock* 3212. Death Valley, *Coville & Funston* 242.

SONORA: Colorado River, *Palmer* 950 and 951 in 1889.

CHIHUAHUA: Casas Grandes, *Townsend & Barber* 353.

DURANGO: Torreón, *Hitchcock* 7725. Durango, *Hitchcock* 7565, 7566; *Palmer* 252 in 1896.

COAHUILA: Saltillo, *Palmer* 380 in 1898; *Hitchcock* 5600, 5607, 5612.

ZACATECAS: Zacatecas, *Hitchcock* 7526.

AGUASCALIENTES: Aguascalientes, *Hitchcock* 7442, 7486.

SAN LUIS POTOSÍ: San Luis Potosí, *Hitchcock* 5655.

JALISCO: Orosco, *Hitchcock* 7385. Guadalajara, *Hitchcock* 7310, 7314; *Palmer* 430 in 1886. Colotlán, *Rose* 3606.

GUANAJUATO: Acámbaro, *Hitchcock* 6935. Irapuato, *Hitchcock* 7387, 7398, 7399; 7421. Guanajuato, *Duges* in 1897.

QUERÉTARO: Querétaro, *Hitchcock* 5820, 5835, 5850, 5851, 5867; *Arsène* 10264; *Basile* 36, 54.

MICHOACÁN: Morelia, *Arsène* in 1910.

MEXICO: Mexico, *Bourgeau* 236, 680; *Pringle* 9585; *Orcutt* 4105; *Hitchcock* 5894.

PUEBLA: Cholula, *Nicolás* in 1910. Tehuacán, *Hitchcock* 6061.

VERACRUZ: Orizaba, *Hitchcock* 6326; *Müller* 2049. Pital, *Liebmann* 377.

OAXACA: Oaxaca, *Hitchcock* 6175, 6181.

MEXICO (Republic of): Without locality, *Liebmann* 386.

GUATEMALA: Guatemala City, *Hitchcock* 9098.

COSTA RICA: San José, *Jiménez* 926; *Cooper* 5992; *Tonduz* 3016; *Pittier* 229. Cartago, *Cooper* 144; *Tonduz* 10754. San Marcos, *Tonduz* 7530. Alajuelita, *Tonduz* 8825.

COLOMBIA: Palmira, *Pittier* 817.

BOLIVIA: Coripati, *Bang* 2108.

ARGENTINA: General Roca, *Fischer* 274.

Echinochloa crusgalli crus-pavonis (H. B. K.) Hitchc.

Oplismenus crus pavonis H. B. K. Nov. Gen. & Sp. **1**: 108. 1816. "Crescit in apricis calidissimis Provinciae Cumanensis prope Bordones." The type, in the Paris Herbarium, has awns mostly 5 to 10 mm. long. The specific name is written as two words.

Panicum sabulicolum Nees, Agrost. Bras. 258. 1829. "Habitat in arenosis Parae (Sieber). Vidi in Herb. Willd.—In Monte Video, et in confinibus Regni Paraguayani legit Sellow. (Herb. Reg. Berol.)." The Sieber specimen (the name in a slightly different form) has been examined in the Willdenow Herbarium. The Sellow specimen has been examined at the Berlin Herbarium. This is the same form as *Oplismenus crus-pavonis*.

Panicum crus-pavonis Nees, Agrost. Bras. 259. 1829. Based on *Oplismenus crus-pavonis* H. B. K. Nees describes a variety α with short awns as in *Oplismenus crus-pavonis*, and a variety β, with long awns. The type of the latter, from the Rio Negro, has awns 15 to 20 mm. long.

Echinochloa composita Presl; Nees, Agrost. Bras. 259. 1829, as synonym of *Panicum crus-pavonis*. It was not published by Presl. The specimen, in the German University at Prague, was collected at Acapulco by Haenke. It is about the same form

as the type of *Oplismenus crus-pavonis*, but the racemes are not so compact; the awns are 2 to 5 mm. long.

Panicum aristatum Macfad. Bot. Misc. Hook. **2**: 115. 1831. This was described in a footnote to an article entitled, "Sketch of a short botanical excursion in Jamaica." The grass was found in the vicinity of Spanish Town. The type specimen, in the Kew Herbarium, is the form described under *Oplismenus crus-pavonis*.

Oplismenus jamaicensis Kunth, Enum. Pl. **1**: 147. 1833. Based upon *Panicum aristatum* Macfad. and referred to *Oplismenus* with a query.

Panicum jamaicense Steud. Nom. Bot. ed. 2. **2**: 257. 1841. Based upon *Oplismenus jamaicensis* Kunth.

Panicum horridum Salzm.; Steud. Syn. Pl. Glum. **1**: 47. 1854. A herbarium name of a Salzmann specimen from Bahia, Brazil, given as synonym of *Panicum crusgalli* L.

Since *Echinochloa crusgalli* itself is rare in South America and the subspecies *crus-pavonis* is common, the plant is probably the subspecies.

Panicum crusgalli var. *sabulicola* Doell in Mart. Fl. Bras. **2**^{2}: 142. 1877. Based on *Panicum sabulicola* Nees.

Oplismenus angustifolius Fourn. Mex. Pl. **2**: 40. 1886. "Vera Cruz (GOUIN n. 54)." The type specimen, in the Paris Herbarium, is the form with awns 1 to 2 cm. long.

Echinochloa sabulicola Hitchc. Contr. U. S. Nat. Herb. **17**: 257. 1913. Based on *Panicum sabulicola* Nees.

FIG. 34.—*Echinochloa crusgalli crus-pavonis*. From *Sintenis* 1889, Porto Rico.

DESCRIPTION.

Differs from the typical form in having nodding, rather soft panicles, the spikelets averaging smaller, less strongly hispid, the awn variable in length, but usually not over 1 cm. long.

DISTRIBUTION.

Marshes and wet places, often in the water, Texas and the West Indies south to Bolivia and Argentina. Apparently native in tropical America.

TEXAS: Pierce, *Tracy* 7743.
LOWER CALIFORNIA: La Paz, *Palmer* 130 in 1890.
CHIHUAHUA: Casas Grandes, *Nelson* 6355a.
SINALOA: Culiacán, *Palmer* 1790 in 1891.
DURANGO: Durango, *Palmer* 730 in 1896.
COAHUILA: Jaral, *Schumann* 1738. Saltillo, *Palmer* 418 in 1898.
JALISCO: Guadalajara, *Palmer* 430 and 430a in 1886; *Hitchcock* 7351. Orosco, *Hitchcock* 7373.
GUANAJUATO: Acámbaro, *Hitchcock* 6949. Irapuato, *Hitchcock* 7420.
QUERÉTARO: Querétaro, *Basile* 30, 31; *Arsène* 10280; *Hitchcock* 5810, 5852, 5866.

MICHOACÁN: Zamora, *Pringle* 8480. Morelia, *Holway* 3591. Maravalio, *Hitchcock* 6923.

MEXICO: Valley of Mexico, *Pringle* 8572, 9606; *Hitchcock* 5879; *Bourgeau* 530.

VERACRUZ: Córdoba, *Hitchcock* 6452. Monte Pacha, *Liebmann* 385. Veracruz, *Smith* 1329. Orizaba, *Botteri* 161, 718; *Hitchcock* 6344.

MORELOS: Cuernavaca, *Hitchcock* 6849.

GUATEMALA: Cobán, *Türckheim* 1287, 3827.

COSTA RICA: Nuestro Amo, *Jiménez* 527. San José, *Hitchcock* 8453; *Pittier* 382.

PANAMA: Chagres, *Fendler* 365. Ancón, *Celestine* 18. Balboa, *Hitchcock* 7999. Pedro Miguel, *Hitchcock* 7958; *Pittier* 2508.

BERMUDA: *Brown, Britton & Russell* 1961; *Collins* 343.

CUBA: Yumurí Mountains, *Rugel* 884. Habana, *Léon* 747, 2785. Without locality, *Wright* in 1865; *Rugel* 889; *Liebmann* 378.

JAMAICA: Savanna-la-Mar, *Hitchcock* 9862. Black River, *Hitchcock* 9650. Grosmond Marsh, *Harris* 11751. Meylersfield, *Harris* 11824.

PORTO RICO: Lares, *Chase* 6596. Humacao, *Sintenis* 1889. San Juan, *Chase* 6352, 6396. Canovanas, *Stevenson* 5388. Rio Piedras, *Stevenson & Rose* 6428. Without locality, *Eggers* 685.

LEEWARD ISLANDS: Guadeloupe, *Duss* 3161.

TRINIDAD: *Bot. Gard. Herb.* 1678.

BRITISH GUIANA: Without locality, *Jenman* 5991; *Schomburgk* 151.

BRAZIL: Minas Geraes, *Regnell* 1374. Campinas, *Campos Novaes* 1250, 1251. São Paulo, *Löfgren* 1539, 2787. Paraná, *Dusen* 7910. Without locality, *Capanema* 5398½; *Jard. Bot.* 145; *Glaziou* 16616.

PARAGUAY: Pilcomayo River, *Morong* 963; *Rojas* 55, 55a. Central Paraguay, *Morong* 539, 743.

URUGUAY: Without locality, *Arechavaleta.*

BOLIVIA: Tarija, *Fries* 1102. Coripati, *Bang* 2108.

ARGENTINA: Misiones, *Ekman* 606, 606a, 607. Catamarca, *Jorgensen* 1399, 1651. Without locality, *Stuckert* 13872.

7. **Echinochloa colonum** (L.) Link.

Panicum colonum L. Syst. Nat. ed. 10. **2**: 870. 1759. No locality is mentioned. In a later work [1] the locality is given as, "Habitat in Indiae cultis." The type specimen in the Linnaean Herbarium [2] was sent from Jamaica by Patrick Browne. The word "colonum" appears to be a genitive plural.[3]

Milium colonum Moench, Meth. Pl. 202. 1794. Based on *Panicum colonum* L.

Oplismenus colonus H. B. K. Nov. Gen. & Sp. **1**: 108. 1816. Based on *Panicum colonum* L.

Panicum zonale Guss. Fl. Sic. Prodr. **1**: 62. 1827. This citation has not been verified. The description refers to the form of *Echinochloa colonum* with zonate leaves.

Oplismenus repens Presl, Rel. Haenk. **1**: 321. 1830. "Hab. in Mexico." A part of the type, sent to Trinius from Prague, has been examined in the Trinius Herbarium at Petrograd.

Echinochloa colona Link, Hort. Berol. **2**: 209. 1833. Based on *Panicum colonum* L.

Panicum incertum Bosc; Steud. Nom. Bot. ed. 2. **2**: 258. 1841. A name only, as synonym of *Panicum colonum* L.

Panicum prorepens Steud. Syn. Pl. Glum. **1**: 46. 1854. Based on *Oplismenus repens* Presl.

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[1] Sp. Pl. ed. 2. 84. 1762.

[2] See Hitchcock, Contr. U. S. Nat. Herb. **12**: 119. 1908.

[3] See Hitchcock, Contr. U. S. Nat. Herb. **17**: 256. 1913.

Panicum colonum zonale L. H. Dewey, Contr. U. S. Nat. Herb. **2**: 502. 1894. Based on *Panicum zonale* Guss.

Echinochloa colona zonalis Woot. & Standl. N. Mex. Coll. Agr. Bull. **81**: 45. 1912. Presumably based on *Panicum zonale* Guss., though no synonym is cited.

Several other synonyms are given in works on European floras.

DESCRIPTION.

Plants annual, the larger ones usually much branched at base; culms prostrate-spreading, ascending, or erect, usually 20 to 40 cm. long, glabrous, compressed; sheaths glabrous, compressed; ligule wanting; blades rather lax, 5 to 10 cm. long, rarely longer, 3 to 6 mm. or rarely as much as 1 cm. wide, somewhat scabrous on the margins, occasionally bearing transverse purple bands (zonate); panicles 5 to 10 or even 15 cm. long, the axis smooth or slightly scabrous; racemes several, 1 to 2 cm. long or rarely longer, appressed or ascending, single or occasionally two approximate, the lower usually distant as much as 1 cm., the rachis triangular-flattened, scabrous; spikelets about 3 mm. long, crowded, nearly sessile, in about 4 rows; second glume and sterile lemma short-pointed but not awned; fruit about 2.5 mm. long, short-pointed.

In this species the spikelets are merely pointed and not awned, but in all other respects it agrees with the concept of the genus.

FIG. 35.—*Echinochloa colonum*. From *Bentley* in 1899, Texas.

DISTRIBUTION.

Ditches and moist places in the warmer parts of both hemispheres; introduced in America, where it is a common weed.

NEW JERSEY: On ballast, Camden, *Martindale* in 1879.

PENNSYLVANIA: On ballast, Girard Point, Philadelphia, *Martindale* in 1879.

MISSOURI: Carruthersville, *Hitchcock* in 1904.

VIRGINIA: Virginia Beach, *Kearney* 2049.

NORTH CAROLINA: Eastern North Carolina, *McCarthy* in 1885.

SOUTH CAROLINA: Santee Canal, *Curtiss* 3611. Aiken, *Ravenel* in 1869. Orangeburg, *Amer. Gr. Nat. Herb.* 425.

GEORGIA: Athens, *Harper* 113. Camilla, *Tracy* 4571. Stone Mountain, *Hitchcock* in 1905.

FLORIDA: Marco, *Hitchcock* 475. Alachua County, *Combs* 691, 729. Little River, *Eaton* 472. Monticello, *Combs* 315. Tallahassee, *Kearney* 84; *Nash* 2337; *Combs* 389. Quincy, *Combs* 410. Chipley, *Combs* 539c. Apalachicola, *Biltmore Herb.* 794b. Chattahoochee, *Curtiss* 5999. Milton, *Chase* 4315. Hillsborough County, *Fredholm* 6358.

TENNESSEE: La Vergne, *Eggert* 73. Knoxville, *Ruth* in 1895; *Scribner* in 1889. Nashville, *Gattinger* in 1878; in *Curtiss N. Amer. Pl.* 3583*.

ALABAMA: Birmingham, *Hitchcock* in 1898. Mobile, *Mohr* in 1879; *Kearney* 66. Tuskegee, *Carver* 85. Selina, *McCarthy* in 1888.

MISSISSIPPI: Starkville, *Kearney* 17. Agricultural College, *Pollard* 1281.

ARKANSAS: Pine Bluff, *Eggert* 111. Texarkana, *Heller* in 1898. Northwest Arkansas, *Harvey* 20.

LOUISIANA: New Orleans, *Waite* in 1885. Shreveport, *Ball* 106. Rayville, *Ball* 6. Alexandria, *Ball* 178. Mount Lebanon, *Ball* 87. Pointe a la Hache, *Langlois* in 1885.

TEXAS: Corpus Christi, *Heller* 1501; *Hitchcock* 5354. Ennis, *Smith* 18. Kerrville, *Heller* 1923; *Hitchcock* 5319. Laredo, *Sauvignet* in 1892; *Hitchcock* 5511. Fort Worth, *Ruth* 164. San Antonio, *Ball* 950; *Amer. Gr. Nat. Herb.* 426. Brownsville, *Hitchcock* 5423. New Braunfels, *Hitchcock* 5200, 5199. El Paso, *Hitchcock* 7808. Riogrande, *Griffiths* 6465. Pierce, *Tracy* 7393. Texarkana, *Letterman* in 1894. Comal County, *Groth* 97. Houston, *Hall* 826. Barstow, *Tracy* 8285. Beaumont, *Plank* 21. Abilene, *Bentley* in 1899. Without locality, *Reverchon* 1091.

WASHINGTON: On ballast, Linnton, *Suksdorf* 7401.

NEW MEXICO: Organ Mountains, *Wooton & Standley* in 1906. Deming, *Hitchcock* 3755. Las Cruces, *Vasey* in 1881.

ARIZONA: Tucson, *Thornber* 283; *Griffiths* 1518, 1534, 3344. Paradise, *Blumer* 1764, 2268. Patagonia, *Hitchcock* 3683. Santa Rita Mountains, *Griffiths* 7007, 7291. Papago Reservation, *Griffiths* 1655. San Bernardino Ranch, *Mearns* 719, 795. La Noria, *Mearns* 1207.

CALIFORNIA: Mecca, *Parish* 8101. Imperial, *Parish* 824.

LOWER CALIFORNIA: 80 miles southeast of San Diego, California, *Palmer* 419 in 1875. Mulejé, *Palmer* 202 in 1887. Santa Agueda, *Palmer* 223 in 1890. San José del Cabo, *Brandegee* 26, 38.

SONORA: La Colorada, *Clokey* 1916, 1917. Guaymas, *Palmer* 51 in 1887, 202 in 1887; *Hitchcock* 3560. Hermosillo, *Hitchcock* 3580, 3620. Alamos, *Rose* 12984. Yaqui River, *Palmer* 13 and 14 in 1869. Cocospora Ranch, *Griffiths* 6832. Oputo, *Hartman* 189.

CHIHUAHUA: Santa Eulalia, *Wilkinson* in 1885. Chihuahua, *Hitchcock* 7780. Sánchez, *Hitchcock* 7690.

SINALOA: Mazatlán, *Rose* 14039. Topolobampo, *Rose* 13265. Rosario, *Rose* 1544, 14574. Culiacán, *Palmer* 1542 in 1891. San Blas, *Rose* 13424.

DURANGO: Tlahualilo, *Pittier* 478. Durango, *Hitchcock* 7655. Torreón, *Hitchcock* 7552.

COAHUILA: Saltillo, *Hitchcock* 5592, 5599.

NUEVO LEÓN: Monterrey, *Hitchcock* 5548.

TEPIC: Acaponeta, *Rose* 1923, 14250.

SAN LUIS POTOSÍ: Cárdenas, *Hitchcock* 5750.

JALISCO: San Nicolás, *Hitchcock* 7224. Río Blanco, *Palmer* 193 in 1886.

GUANAJUATO: Acámbaro, *Hitchcock* 6941. Irapuato, *Hitchcock* 7413.

QUERÉTARO: Querétaro, *Hitchcock* 5831.

COLIMA: Caldras, *Hitchcock* 7020. Colima, *Palmer* 169 in 1897.

MICHOACÁN: Morelia, *Arsène* in 1909.

PUEBLA: Tehuacán, *Hitchcock* 6052.

VERACRUZ: Orizaba, *Bourgeau* 2593; *Hitchcock* 6325. Guiotepec, *Liebmann* 383. Veracruz, *Hitchcock* 6569.

MORELOS: Cuernavaca, *Hitchcock* 6836.

GUERRERO: Balsas, *Hitchcock* 6802. Iguala, *Rose* 9386.

OAXACA: Oaxaca, *Hitchcock* 6125. Tomellín, *Hitchcock* 6228; *Rose* 10048.

YUCATÁN: Izamal, *Gaumer* 2484.

GUATEMALA: Gualán, *Deam* 6322.

SALVADOR: La Unión, *Hitchcock* 8793.

NICARAGUA: Corinto, *Hitchcock* 8741.

COSTA RICA: Puntarenas, *Hitchcock* 8531. Salinas, *Pittier* 2704. Alajuelita, *Tonduz* 8827. San José, *Pittier* 2830; *Jiménez* 928.

PANAMA: Corozal, *Pittier* 2184, 6770. New Frijoles, *Pittier* 6837. Empire, *Pittier* 3720, 3723. Culebra, *Hitchcock* 7922. Balboa, *Celestine* 14. Miraflores, *Pittier* 2505.

BERMUDA: *Brown, Britton & Bisset* 2147; *Collins* 154.

CUBA: Cienfuegos, *Pringle* 45. Cabañas, *Palmer & Riley* 756. Habana, *Palmer & Riley* 1137; *Léon* 752, 844. Santa María, *Linden* 1814. Manacas, *Léon* 5904. Regla, *Liebmann* 376. Buenaventura, *Wilson* 9320. Guane, *Shafer* 10392. Paso Estancia, *Shafer* 1561. Sierra Guayaba, *Shafer* 13852. Sancti Spiritus, *Shafer* 12152. Santiago de las Vegas, *Baker* 502, 4765; *Hitchcock* 490. Isle of Pines, *Curtiss* 427. Guines, *Léon* 425. Arroyo Apolo, *Léon* 303. Without locality, *Wright* 752.

JAMAICA: Savoy, *Harris* 11612. Hope Grounds, *Harris* 11241. Halls Delight, *Harris* 11419. Gordon Town, *Hart* 825. Ipswich, *Hitchcock* 9594. Bog Walk, *Hitchcock* 9288. Savanna-la-Mar, *Hitchcock* 9867. Montpellier, *Harris* 11806.

SANTO DOMINGO: Rincón, *Fuertes* 1274. San Pedro de Macoris, *Rose* 4438. Azua, *Rose* 3950, 4421.

PORTO RICO: Rio Piedras, *Barrett* 64; *Cowgill* 694. Guanica, *Millspaugh* 732; *Chase* 6530. Mayaguez, *Heller* 4409; *Chase* 6252. Puente Fluco, *Goll* 878. San Antonio, *Goll* 186. Caguas, *Millspaugh* 214. Catano, *Heller* 108. Coamo Springs *Goll* 660. Cabo Rojo, *Sintenis* 845. San Juan, *Chase* 6381. Vieques, *Chase* 6689; *Shafer* 2483. Culebra, *Britton & Wheeler* 145; *Millspaugh* 569.

VIRGIN ISLANDS: St. Thomas, *Eggers* 291; *Millspaugh* 335. Tortola, *Fishlock* 65, 108. St. Croix, *Ricksecker* 31, 106.

LEEWARD ISLANDS: St. Kitts, *Britton & Cowell* 282. Antigua, *Wullschlaegel* 612. Montserrat, *Shafer* 704. Guadeloupe, *Duss* 2684. Dominica, *Jones* 32.

WINDWARD ISLANDS: Martinique, *Duss* 1322. Barbados, *Bot. Sta. Herb.* 240.

TRINIDAD: *Broadway* 4936; *Bot. Gard. Herb.* 2285; *Hitchcock* 10026.

TOBAGO: *Broadway* 4648; *Hitchcock* 10211.

COLOMBIA: Cartagena, *Hitchcock* 9904. Santa Marta, *Smith* 150.

BRAZIL: Bahia, *Löfgren* 3766. Without locality, *Capanema* 5393.

PARAGUAY: Sierra de Amambay, *Rojas* 10785, 10785a. Apa River, *Hassler* 11929.

ECUADOR: Without locality, *Jameson* 346. Galápagos Islands, *Stewart* 1300.

URUGUAY: Without locality, *Arechavaleta*.

ARGENTINA: Estancia San Teodoro, *Kneucker Gram. Exs.* 185.

CHILE: Santiago, *Philippi* in 1888.

DOUBTFUL SPECIES.

PANICUM ECHINATUM Willd. Enum. Pl. 1032. 1809. "*Panicum muricatum* Hornem. Cat. hort. haf. p. 28 * * * Non est *P. muricatum* Retzii." "Habitat in America meridionali." The type has not been examined, and the brief diagnosis is insufficient for identification. In Hornemann's catalogue the name is ascribed to Retzius, and there is no description.

OPLISMENUS ECHINATUS Kunth, Rév. Gram. 1: 45. 1829. Based on "*Panicum echinatum* Willd."

THE NORTH AMERICAN SPECIES OF CHAETOCHLOA.

By A. S. Hitchcock.

INTRODUCTION.

The genus *Chaetochloa* is closely allied to *Panicum*, from which it is separated technically by the presence of bristle-like sterile branchlets below the spikelets. Two species, introduced from Europe, are common weeds in the eastern states. One, *C. lutescens* (*Setaria glauca* of authors), with a dense cylindric spikelike panicle or head, and yellow bristles, is called yellow foxtail or pigeon grass. The other, green foxtail (*C. viridis*), has green heads. The bristly head or narrow panicle is characteristic of most of the species of the genus. One species, *C. italica* (*Setaria italica*), is cultivated under the name of millet or foxtail millet. Of this there are many varieties, such as Hungarian grass, German millet, and Golden Wonder. To these the general term millet is applied, a name which should not be confused with the common millet of Europe (*Panicum miliaceum*), cultivated occasionally in the United States for forage under the name of broomcorn millet, proso millet, and hog millet. The North American species of *Chaetochloa* were revised in 1900 by Scribner and Merrill.[1]

The allies of *Panicum palmifolium* are here included under *Chaetochloa* as a subgenus (*Ptychophyllum*). They are tropical species with broad plaited blades. Some are cultivated in greenhouses under the name of palm grass, because of the leaves which resemble those of a young palm.

In a small group of species of *Panicum* (forming the subgenus *Paurochaetium*[2]) the ultimate branchlets are produced beyond the few to several spikelets as minute bristles. In *Chaetochloa* proper each spikelet is subtended by one or more bristles. In the subgenus *Ptychophyllum* usually only the terminal of the one to few spikelets on a branchlet is subtended by the bristle. *Panicum* and *Chaetochloa* thus closely approach each other. The species of the subgenera *Paurochaetium* and *Ptychophyllum* are included respectively in *Panicum* and *Chaetochloa* because, all their characters taken into consideration, they show closer relationship to other species in *Panicum* and *Chaetochloa*, respectively, than they do to each other.

[1] U. S. Dept. Agr. Div. Agrost. Bull. 21. 1900.

[2] Contr. U. S. Nat. Herb. **15:** 22. 1910.

168000—20——4

The name *Setaria*, applied to this genus by many authors, has been replaced by *Chaetochloa* because the former name was applied to a genus of lichens by Acharius and by Michaux at a date earlier than that of its application to the grass genus (see synonymy in the technical description).

There are about 60 species of *Chaetochloa*, 26 in North America, about 15 more in South America, the remainder in the warmer parts of the Eastern Hemisphere.

The text figures are natural size.

DESCRIPTION OF THE GENUS AND SPECIES.

CHAETOCHLOA Scribn.

Setaria Beauv. Ess. Agrost. 51. *pl. 13. f. 3.* 1812. Not *Setaria* Ach. 1798,[1] nor Michx. 1803. Fourteen species are listed, *S. viridis* being illustrated. *Panicum viride* L., upon which the illustrated species is based, is taken as the type.

Panicum subgenus *Ptychophyllum* A. Br. Ind. Sem. Hort. Berol. App. 1855. The author mentions the plicate-leaved species of *Panicum* that had been long cultivated in botanic gardens under the name of *P. plicatum* Auct. He describes *Ptychophyllum* as a subgenus of *Panicum* and notes its close affinity to the subgenus *Setaria*. Ten species are described, the first of which is *Panicum plicatum* Lam. This species may be taken as the type.

Chaetochloa Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 38. 1897. Scribner substitutes the name *Chaetochloa* for *Setaria* Beauv., not Ach. The type is the same as for *Setaria*, namely *Panicum viride* L.

Some of our species of *Chaetochloa* have been referred to *Ixophorus* Schlecht. and to *Chamaeraphis* R. Br., but the types of those genera are not congeneric with the type of *Chaetochloa*.

DESCRIPTION.

Annual or perennial grasses with flat or rarely involute blades, and narrow, usually spikelike, or rarely open panicles. Culms simple or usually branched at the base and sometimes at the middle nodes, the branches from the latter appressed or ascending, bearing secondary panicles, these usually smaller than those of the primary culms. Spikelets lanceolate or elliptic, usually turgid, rarely globose, sessile or short-pediceled, single or in clusters, some or all subtended by one to several bristles (sterile branchlets), deciduous, falling free from the bristles, awnless, the main branches of the panicle usually short, rarely elongate. First glume broad, usually less than half the length of the spikelet, 3 to 5 nerved. Second glume and sterile lemma equal or the former shorter, several-nerved. Fertile lemma coriaceous or indurate, smooth or rugose.

KEY TO THE SPECIES.

Blades narrowly elliptic, plaited; bristles below only a part of the spikelets, rarely below all. Subgenus PTYCHOPHYLLUM.

Plants annual; blades usually less than 2 cm. wide.....**1. C. barbata.**

Plants perennial; blades usually more than 3 cm. wide.

Panicle of numerous approximate, more or less 1-sided racemes, spikelet-bearing to the base, 2 to 5 cm. long, rarely the lower much longer..**2. C. poiretiana.**

Panicle of more or less fascicled branches, not or scarcely 1-sided, some of them elongate and naked at base.

Branches of panicle as much as 10 cm. long; bristles usually not over twice as long as the spikelets, inconspicuous; blades as much as 6 cm. wide.
3. C. palmifolia.

Branches of panicle slender, finally spreading, as much as 20 cm. long; bristles as much as 15 mm. long; blades as much as 10 cm. wide..**4. C. sulcata.**

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[1] See note at bottom of p. 208.

Blades linear-lanceolate to linear, narrow; bristles below all the spikelets. CHAETOCHLOA proper.

Bristles below each spikelet numerous, at least more than 5. Panicle dense, cylindric, spikelike.

Plants annual; spikelets 3 mm. long.....**5. C. lutescens.**

Plants perennial; spikelets mostly 2 to 2.5 mm. long.....**6. C. geniculata.**

Bristles below each spikelet 1, or, by the abortion of the spikelets, 2 or 3.

Bristles more or less retrorsely scabrous.

Plants perennial; spikelets globose or nearly so.....**7. C. tenax.**

Plants annual; spikelets not globose.

Spikelets about 2 mm. long.....**8. C. verticillata.**

Spikelets about 1.5 mm. long.

Panicles usually green, rarely as much as 8 cm. long, less than 5 mm. thick, the bristles 2 to 3 mm. long.....**9. C. scandens.**

Panicles usually purple, as much as 15 cm. long and 1 cm. thick, the bristles about 1 cm. long.....**10. C. tenacissima.**

Bristles antrorsely scabrous only.

Plants annual.

Fertile lemma at maturity finely cross-lined or nearly smooth.

Panicle loosely flowered, tapering above.....**11. C. grisebachii.**

Panicle compactly flowered, sometimes interrupted at base.

Plants as much as 3 meters tall. Bristles 1 to 2 cm. long; fertile lemma smooth or nearly so.....**12. C. magna.**

Plants mostly less than 1 meter tall.

Axis of panicle scabrous but not villous.....**13. C. ambigua.**

Axis of panicle villous.

Panicle cylindric, tapering above, green; spikelet falling entire. **14. C. viridis.**

Panicle lobed or interrupted, often large and heavy, purple or yellow; fruit deciduous from glumes and sterile lemma. **15. C. italica.**

Fertile lemma coarsely transversely rugose.

Axis of panicle thickly clothed with white stiff hairs 2 mm. long. **16. C. longipila.**

Axis of panicle villous, the hairs about 1 mm. long.

Panicle densely flowered, cylindric. Sheaths scabrous. **17. C. corrugata.**

Panicle loosely flowered.

Blades scabrous but not hispid.....**18. C. liebmanni.**

Blades sparsely hispid.....**19. C. latifolia.**

Plants perennial.

Spikelets 3 mm. long.

Blades scabrous.....**20. C. macrosperma.**

Blades villous.....**21. C. villosissima.**

Spikelets 2 to 2.5 mm. long.

Panicle attenuate at apex.

Blades linear-lanceolate, more than 5 mm. broad; panicle interrupted or branched, the branches 1 to 3 cm. long.....**22. C. setosa.**

Blades slender, mostly less than 5 mm. broad; panicle slender, very narrow.....**23. C. rariflora.**

Panicle often narrowed toward the summit but not attenuate.

Branches of primary panicle stiffly ascending, of about equal length except toward the summit; panicle yellowish or brownish, the bristles 1 to 2 cm. long.....**24. C. vulpiseta.**

Branches of panicle short or only the lower as much as 2 to 3 cm. long; panicle pale or greenish, the bristles irregular in length, the longer sometimes 1 to 1.5 cm. long.

Blades mostly less than 1 cm. wide, often folded; panicle usually loosely or interruptedly spikelike, the branches usually not over 1 cm. long.....**25. C. macrostachya.**

Blades flat, as much as 1.5 cm. wide; panicle tapering from near the base, the lower branches as much as 3 cm. long.

26. C. scheelei.

Subgenus **PTYCHOPHYLLUM** (A. Br.) Hitchc.

Mostly robust perennials (one species annual) with large flat plicate blades. Bristles single below only the terminal spikelet of the ultimate branchlets, or rarely below all the spikelets. Panicles simple or the secondary branchlets very short, the spikelets or branchlets more or less secund. Spikelets mostly narrower and less turgid than in *Chaetochloa* proper. Fertile lemma acute or apiculate, rugose or only obscurely cross-wrinkled. Confined to tropical regions of both hemispheres.

1. Chaetochloa barbata (Lam.) Hitchc. & Chase.

Panicum barbatum Lam. Tabl. Encycl. **1:** 171. 1791. "Ex Insula Franciae [Mauritius]." The type has not been examined.

Panicum costatum Roxb. Fl. Ind. ed. Carey **1:** 314. 1820. "Introduced into the Botanic Garden from Mauritius, by Captain Tennant, in 1802." The type has not been examined.

Panicum viaticum Salzm.; Doell in Mart. Fl. Bras. **2**^{2}: 155. 1877. "Habitat in sepibus et ad vias prope Bahia (*Salzmann* n. 706)." A duplicate type is in the National Herbarium. Doell states that he has seen an authentic specimen of *Panicum barbatum* Lam., which he cites as a synonym under *P. viaticum*.

Chamaeraphis viatica Kuntze, Rev. Gen. Pl. **2:** 770. 1891. Based on *Panicum viaticum* Salzm.

Chamaeraphis costata Kuntze, Rev. Gen. Pl. **2:** 771. 1891. Based on *Panicum costatum* Roxb.

Chaetochloa barbata Hitchc. & Chase, Contr. U. S. Nat. Herb. **18:** 348. 1917. Based on *Panicum barbatum* Lam.

Chaetochloa barbata is described by Grisebach [1] and Hooker [2] under *Panicum flavescens* Swartz.

DESCRIPTION.

Plants annual; culms decumbent, spreading, often rooting at the lower nodes, branching, glabrous, scabrous or villous near the pubescent nodes, as much as 2 meters long, but often much less; sheaths compressed, ciliate, glabrous or papillose-hispid; ligule about 1 mm. long, densely ciliate; blades narrowly elliptic, flat and rather thin, the upper narrowed to a somewhat truncate base, the lower gradually narrowed to a petiole, as much as 30 cm. long and 2.5 cm. wide, distinctly plicate in large specimens, obscurely so in dwarf ones; panicles long-exserted, green, as much as 20 cm. long, the rachis scabrous and villous, the branches ascending or spreading, as much as 4 cm. long; spikelets oblong-elliptic, glabrous, about 2.5 mm. long, tending to be in two rows along the branches, at least along the upper part, often clustered on branchlets on the lower part of the branches, the pedicels very short, the bristles flexuous, 5 to 10 mm. long, usually rather numerous; first glume circular, one-third the length of the spikelet, 3-nerved; second glume about two-thirds as long as the spikelet, ovate, acute, 7-nerved; sterile lemma as long as the fertile, acute, 7-nerved, the palea about as long and wide as the lemma; fertile lemma elliptic, acute, a little over 2 mm. long, strongly transverse-rugose, the palea inclosed to the tip.

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[1] Griseb. Fl. Brit. W. Ind. 547. 1864. [2] Hook. f. Fl. Brit. Ind. **7:** 56. 1896.

As usual with annuals, this species varies greatly in the size of the plants. Vigorous plants may have numerous culms as much as 2 meters long, with correspondingly large blades and panicles; dwarf plants may be only 10 cm. tall, with obscurely plicate blades and few-flowered spikelike panicles.

DISTRIBUTION.

A weed in cultivated ground and waste places from the West Indies to Brazil; a waif in Florida; introduced from tropical Asia.

FLORIDA: Apalachicola, *Biltmore Herb.* 8374 (in ballast). Miami, spontaneous on grounds of Subtropical Station.

JAMAICA: Constant Spring, *Hitchcock* 9270, 9277. Castleton Gardens, *Amer. Gr. Nat. Herb.* 603. Kingston, *Hitchcock* 9473; *Cockerell* in 1892. Bog Walk, *Hitchcock* 9308. Ewarton, *Hitchcock* 9412. Ramble, *Hitchcock* 9515. Gordon Town, *Harris* 11511. Ferry River, *Harris* 11782. Temple Hall, *Harris* 11360. Mavis Bank, *Harris* 11602. Montego Bay, *Hitchcock* 9694. Buff Bay, *Hitchcock* 9768. New Forest, *Hitchcock* 9834. Troy, *Hitchcock* 9793. Ipswich, *Hitchcock* 9604.

PORTO RICO: Mayaguez, *Chase* 6159; *Holm* in 1915; *Heller* 4373, 4488.

FIG. 36.—*Chaetochloa barbata*. From *Amer. Gr. Nat. Herb.* 603, Jamaica.

LEEWARD ISLANDS: Antigua, *Rose* 3391; *Wullschlaegel* 618. Guadeloupe, *Duss* 3175. Dominica, *Jones* 43.

WINDWARD ISLANDS: Martinique, *Duss* 544. Barbados, *Eggers* 7128. St. Lucia, *Glasgow* 10. Grenada, *Broadway* in 1904.

TRINIDAD: Port of Spain, *Hitchcock* 9965.

TOBAGO: *Broadway* 4335, 4737; *Hitchcock* 10225, 10251.

BRAZIL: Bahia, *Salzmann*.

2. **Chaetochloa poiretiana** (Schult.) Hitchc.

Panicum elongatum Poir. in Lam. Encycl. Suppl. **4**: 278. 1816. Not *Panicum elongatum* Salisb. 1796, nor Pursh, 1814. "Cette plante croît au Brésil (V. s. in herb. Desfont.)." The type, in the Desfontaines Herbarium at Florence, consists of a portion of a blade and a nearly complete panicle.

Panicum sulcatum Bertol. Excerp. 14. 1820. Not *Panicum sulcatum* Aubl. This citation has not been verified. The species is said to be from Brazil and apparently is described independently of *P. sulcatum* Aubl.

Setaria sulcata Raddi, Agrost. Bras. 50. 1823. Based on *Panicum sulcatum* Bertol.

Panicum poiretianum Schult. Mant. **2**: 229. 1824. Based on *P. elongatum* Poir. not Pursh.

Panicum speciosum Nees, Agrost. Bras. 252. 1829. "Habitat in campis ad Almeirim provinciae Paraensis." The type, collected in Pará by Martius, is in the Munich Herbarium. The branches of the panicle are spreading and the spikelets are 4 to 5 mm. long.

Panicum crus ardeae Willd.; Nees, Agrost. Bras. 253. 1829. "Habitat in America meridionali." The type is in the Willdenow Herbarium at Berlin.

Setaria poiretiana Kunth, Rév. Gram. **1**: 47. 1829. Based on *Panicum poiretianum* Schult.

Setaria crus ardeae Kunth, Rév. Gram. **1**: Suppl. XII. 1830. Based on *Panicum crus ardeae* Willd.

Panicum flabellatum Steud. Syn. Pl. Glum. **1**: 53. 1854. "Bahia." The type was collected in Bahia by Salzmann. A duplicate type, distributed as *Agrostis flabellata* Salzm., is in the National Herbarium.

Agrostis flabellata Salzm.; Steud. Syn. Pl. Glum. **1**: 53. 1854, as synonym under *Panicum flabellatum* Steud.

Setaria jurgensenii Fourn. Mex. Pl. **2**: 42. 1886. "(JURG. n. 692)" is cited, the locality other than Mexico being unknown. The type has not been examined but the description applies to *C. poiretiana*.

Chamaeraphis crus ardeae Kuntze, Rev. Gen. Pl. **2**: 770. 1891. Based on *Panicum crus ardeae* Willd.

Chamaeraphis speciosa Kuntze, Rev. Gen. Pl. **2**: 770. 1891. Based on *Panicum speciosum* Nees. Kuntze merely lists "*Chamaeraphis speciosa* (A. Br.)." This probably refers to *Panicum speciosum* Nees, which Braun placed in the subgenus *Ptychophyllum*.

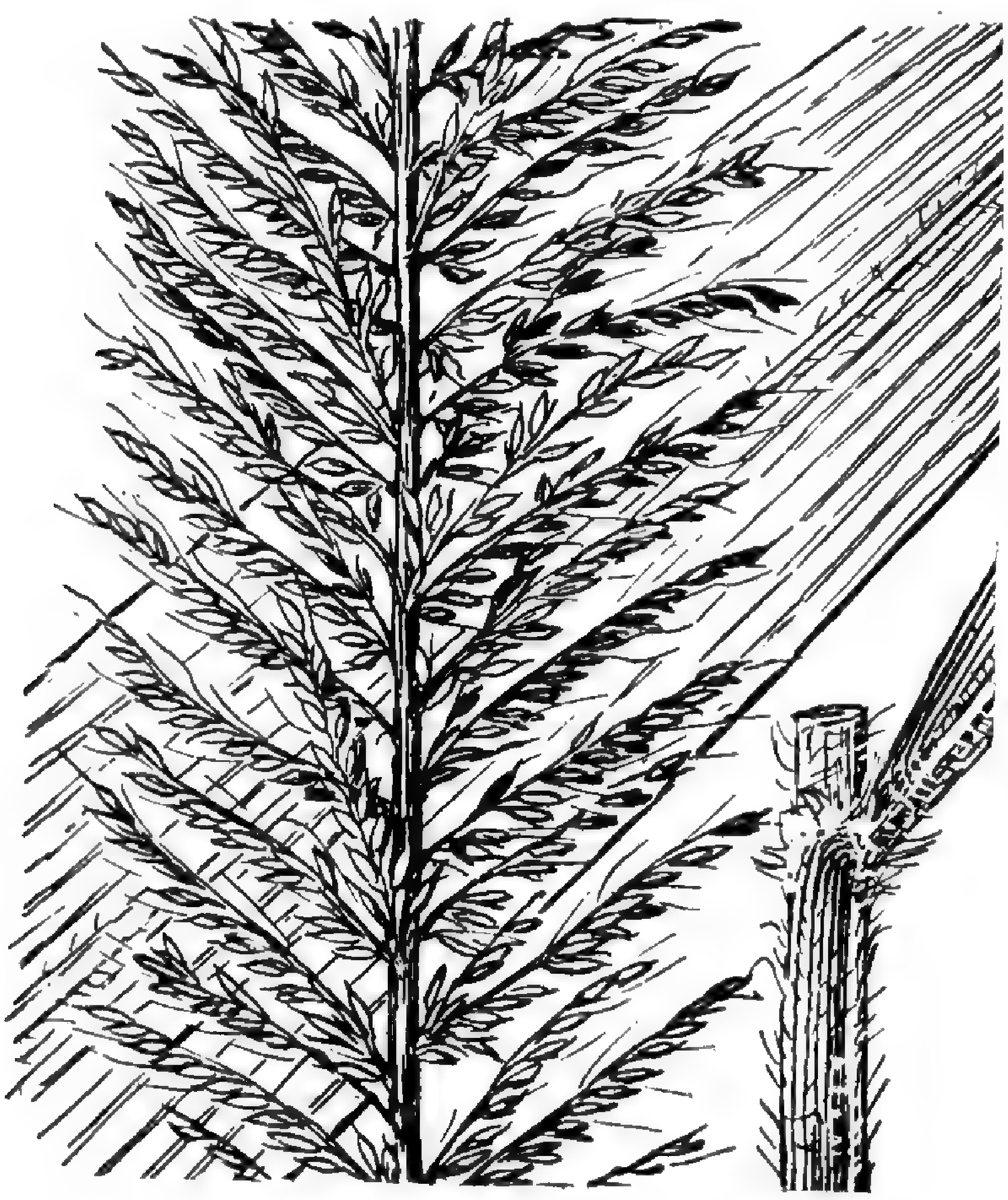

FIG. 37.—*Chaetochloa poiretiana*. From *Pringle* 3921, Mexico.

Chamaeraphis juergensii [*jurgensenii*] Kuntze, Rev. Gen. Pl. **2**: 770. 1891. Based on *Setaria jurgensenii* Fourn.

Panicum jurgensenii Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 40. 1900. Based on *Setaria jurgensenii* Fourn.

In previous papers [1] the name *C. sulcata* was applied to this species. See note on the type of *Panicum sulcatum* p. 162.

DESCRIPTION.

Plants perennial, cespitose; culms erect, 1 to 1.5 meters tall, glabrous, or villous in the vicinity of the nodes; sheaths papillose-hispid, mostly longer than the inter-

[1] Contr. U. S. Nat. Herb. **17**: 260. 1913, and op. cit. **18**: 348. 1917.

nodes, the uppermost elongate, scabrous; ligule ciliate, about 2 mm. long; blades strongly plicate, scaberulous, sometimes sparsely hispid, flat, as much as 1 meter long and 10 cm. wide, narrowed toward each end, the base resembling a petiole; panicles erect, densely flowered, commonly purple, long-exserted, as much as 60 cm. long, and 10 cm. wide, the axis puberulent, the branches ascending, irregularly clustered, approximate, usually somewhat falcate, the lower usually 3 to 5 cm. but sometimes as much as 10 cm. or the distant lowermost even longer; spikelets secund on the branches, narrowly ellipsoidal, about 3 mm. long, the pedicels puberulent, usually very short, some or all on each branch subtended by somewhat flexuous bristles 5 to 10 mm. long; first glume half as long as the spikelet, oval, obtuse, 5-nerved; second glume similar to the first, two-thirds the length of the spikelet, 5-nerved; sterile lemma oblong-ovate, acutish, equaling the fertile one, obscurely 5-nerved, the palea wanting; fertile lemma somewhat coriaceous, ellipsoid, apiculate, very obscurely cross-wrinkled; palea similar to the lemma in texture and marking, the apex free.

DISTRIBUTION.

Moist woods, Mexico to Brazil. Called gamalote in Trinidad.

San Luis Potosí: Las Canoas, *Pringle* 3921. Tamasopo Canyon, *Pringle* 3452.
Veracruz: Mirador, *Liebmann* 459, 460, 461. Jalapa, *Hitchcock* 6685.
Oaxaca: Oaxaca, *Galeotti* 5856.
Chiapas: Turubula, *Nelson* 3359.
Trinidad: Port of Spain, *Hitchcock* 9978, 10171; *Amer. Gr. Nat. Herb.* 604. Cedros, *Hitchcock* 10150.
Tobago: *Hitchcock* 10282.
Colombia: Icononzo, *Pennell* 2841 (N. Y. Bot. Gard. Herb.).
Venezuela: Río Macareo, *Eggers* 13259. Paparo, *Pittier* 6335.
Brazil: Minas Geraes, *Regnell* 459. Descanço, *Widgren* 926. Goyaz, *Gardner* 3519. Organ Mountains, *Wilkes Expl. Exped.* 15. Rio de Janeiro, *Glaziou* 17396. Campinas, *Campos Novaes* 1244. Bahia, *Rose* 19655; *Riedel*. Pará, *Martius* 562. Paraná, *Dusén* 11606.
Paraguay: Central Paraguay, *Morong* 444. Pilcomayo River, *Morong* 1572; *Lindman* 1899.
Peru: Santa Ana, *Cook & Gilbert* 1429, 1523. Peruvian Andes, *Poeppig* 968.
Bolivia: Ixiamas, *Williams* 991 (N. Y. Bot. Gard. Herb).
Argentina: Misiones, *Ekman* 608.

3. **Chaetochloa palmifolia** (Willd.) Hitchc. & Chase.

Panicum plicatum Willd. Enum. Pl. 1033. 1809. Not *Panicum plicatum* Lam. 1791. "Habitat in India orientali." A specimen in the Willdenow Herbarium in Berlin, cultivated in Calcutta by Roxburgh and sent by him to Willdenow, is probably the type.

Panicum palmifolium Willd.; Poir. in Lam. Encycl. Suppl. **4**: 282. 1816. Poiret states that the native place of this is not known. He cites *Panicum plicatum* Willd. Enum. Pl. **2**: 1033. 1809, not Lam. Encycl., and quotes the description, adding a description of his own. The locality given by Willdenow is "in India orientali." Poiret says that he saw a specimen in the Desfontaines Herbarium. This specimen was examined in Florence. *Panicum palmaefolium* Koen.[1] may be the same as *P. palmifolium* or it may be *P. plicatum* Lam., but it is a nomen nudum, being mentioned in a running account of travels.

Panicum plicatum haitiense Kunth; Griseb. Fl. Brit. W. Ind. 547. 1864, as synonym of *P. palmifolium* Poir. This name is credited to Kunth, but the latter appears not to have published it.

[1] Naturforsch. **23**: 208. 1788.

Chamaeraphis palmifolia Kuntze, Rev. Gen. Pl. **2**: 771. 1891. Based on *Panicum palmifolium* Willd.

Setaria palmifolia Stapf, Journ. Linn. Soc. Bot. **42**: 186. 1914. Based on *Panicum palmaefolium* Koen.

DESCRIPTION.

Plants perennial; culms 1 to 1.5 meters tall, glabrous or sparsely villous, the nodes puberulent; sheaths papillose-hispid or glabrate, hispid on the collar; ligule densely ciliate, about 2 mm. long; blades strongly plicate, flat, pubescent or glabrate, elliptic, narrowed to a petiole-like base, as much as 50 cm. long and 6 cm. wide; panicles rather loose and open, green, long-exserted, as much as 40 cm. long, the rachis scabrous, the branches ascending or spreading, scattered, somewhat distant, especially below, 5 to 10 cm. long, compound; spikelets lanceolate, acute, about 3 mm. long, closely arranged on short branchlets appressed along the main branches, forming interrupted compound racemes, the bristles inconspicuous, usually not over twice as long as the spikelets, often short and imperfectly developed; first glume one-third the length of the spikelet, obtuse, 5-nerved; second glume acutish, half the length of the spikelet, 7-nerved, the outer nerves obscure; sterile lemma 5-nerved, acute, exceeding the fertile lemma, the palea narrow, about half as long as the lemma; fertile lemma lanceolate, acute, somewhat apiculate, 2.5 mm. long, obscurely cross-wrinkled, the palea entirely included in the margins of the lemma.

FIG. 38.—*Chaetochloa palmifolia*. From *Hitchcock* 9727, Jamaica.

DISTRIBUTION.

Rocky woods and shady banks, often growing in large colonies, a native of southeastern Asia; introduced in Jamaica.

JAMAICA: Gordon Town, *Amer. Gr. Nat. Herb.* 605; *Hart* 815. Cinchona, *Hitchcock* 9719; *Harris & Lawrence* 15232. Buff Bay, *Hitchcock* 9762. Mount Hybla, *Harris* 11535. Catherines Peak, *Hitchcock* 9727. Hardware Gap, *Harris* 10911. Castleton, *Harris* 11286. Morces Gap, *Nichols* 37.

4. **Chaetochloa sulcata** (Aubl.) Hitchc.

Panicum sulcatum Aubl. Pl. Guian. **1**: 50. 1775. In this work, the flora of French Guiana, Aublet states that this grows along rivers but gives no definite locality. The type has not been examined. Aublet's short diagnosis "Panicum (sulcatum) latifolium foliis liratis" is taken directly from Plumier's Catalogue,[1] "Milium lati-

[1] Plum. Cat. Pl. Amer. 10. 1703.

folium foliis liratis " which Aublet cites as a synonym. Aublet further cites Milium latifolium sulcatum Plum. mss. 4. t. 105. Lamarck [1] gives a more complete description, citing Plumier's Catalogue and the manuscript plate (105), and *P. sulcatum* Aubl. He states that the plant grows in Martinique where it was observed by Plumier, and that he has seen the specimen in Vaillant's herbarium. Urban [2] states that the species agrees with "Codex Boerh. II. tab. 641," a manuscript work. Urban unites with *Panicum sulcatum* the specimens which in this article are referred to *Chaetochloa palmifolia*.

Panicum paniculiferum Steud. Syn. Pl. Glum. **1**: 54. 1854. "Oaxaca." The type specimen has not been definitely located. Galeotti's no. 5858 from Oaxaca, the only collection cited by Fournier under *Setaria paniculifera*, is in the Paris Herbarium. This specimen, which may be the type of *Panicum paniculiferum*, consists only of the inflorescence and a fragment of the culm; the lower panicle branches are as much as 20 cm. long, and the branchlets are appressed or ascending.

Setaria effusa Fourn. Mex. Pl. **2**: 42. 1886. Several specimens from Veracruz and Oaxaca are cited, the first being *Bourgeau* 2599, from Orizaba. This specimen has spreading branches and branchlets, with less crowded spikelets and rather fewer bristles. Hitchcock's no. 6380 from Orizaba has a like panicle. These represent only an extreme form, connected by intergrades with the less open, more bristly form represented by Galeotti's no. 5858.

Setaria paniculifera Fourn. Mex. Pl. **2**: 42. 1886. Based on *Panicum paniculiferum* Steud.

Chamaeraphis effusa Kuntze, Rev. Gen. Pl. **2**: 770. 1891. Based on *Setaria effusa* Fourn.

Chamaeraphis paniculifera Kuntze, Rev. Gen. Pl. **2**: 770. 1891. Based on *Panicum paniculiferum* Steud.

Chamaeraphis sulcata Kuntze, Rev. Gen. Pl. **2**: 770. 1891. Based on *Panicum sulcatum* Aubl.

Panicum mexicanum Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 40. 1900. Based on *Setaria effusa* Fourn.

Chaetochloa sulcata Hitchc. Contr. U. S. Nat. Herb. **17**: 260. 1913. Based on *Panicum sulcatum* Aubl.

DESCRIPTION.

Plants perennial; culms robust, as much as 4 meters tall, glabrous, the nodes glabrous; sheaths papillose-hispid all over or only at the margin, hispid on the collar; ligule a ciliate membrane 1 to 2 mm. long; blades flat, strongly plicate, somewhat scabrous, as much as 1 meter long and 10 cm. wide at the middle, tapering toward each end, the lower into a long petiole-like base; panicles green or purplish, often very large, as much as 70 cm. long, the branches ascending, finally spreading, as much as 20 cm. long, these branching and rebranching, the panicle often becoming loose and open, the axis somewhat scabrous, the branches strongly scabrous-pubescent; spikelets usually loosely arranged, elliptic-lanceolate, about 3 mm. long, obscurely nerved, scabrous-pubescent, the flexuous bristles as much as 15 mm. long; first glume nearly half as long as the spikelet, obtuse, 3 to 5-nerved; second glume about two-thirds as long as spikelet, acutish, 5 to 7-nerved; sterile lemma about as long as the fertile, acute, 5-nerved, the palea narrow, shorter than the lemma; fertile lemma acute, slightly apiculate, closely but distinctly transverse-rugose, the palea inclosed to the tip.

[1] Encyl. **4**: 746 bis. 1798.

[2] Repert. Nov. Sp. Fedde **16**: 148. 1919.

DISTRIBUTION.

Moist ground and shady banks, southern Mexico to northern South America and north in the Windward Islands to Guadeloupe. Called gamalote in Tobago.

VERACRUZ: Hacienda de Jovó, *Liebmann* 452. Zacuapan, *Purpus* 2904, 2907. Mirador, *Liebmann* 455, 456; *Mohr* in 1857. Córdoba, *Hitchcock* 6395; *Kerber* 110; *Ross* 551; *Bourgeau* 1457. Orizaba, *Hitchcock* 6380; *Botteri* 105, 1986.

OAXACA: Tonaguia, *Liebmann* 454. Comaltepeque, *Galeotti* 5858.

TABASCO: Tamulté, *Rovirosa* 616.

CHIAPAS: Ocuilapa, *Nelson* 3059.

GUATEMALA: Puerto Barrios, *Hitchcock* 9155. Sepacuité, *Collins & Goll* 09. Cubilquitz, *Türckheim* 8030.

HONDURAS: San Pedro Sula, *Thieme* 5589.

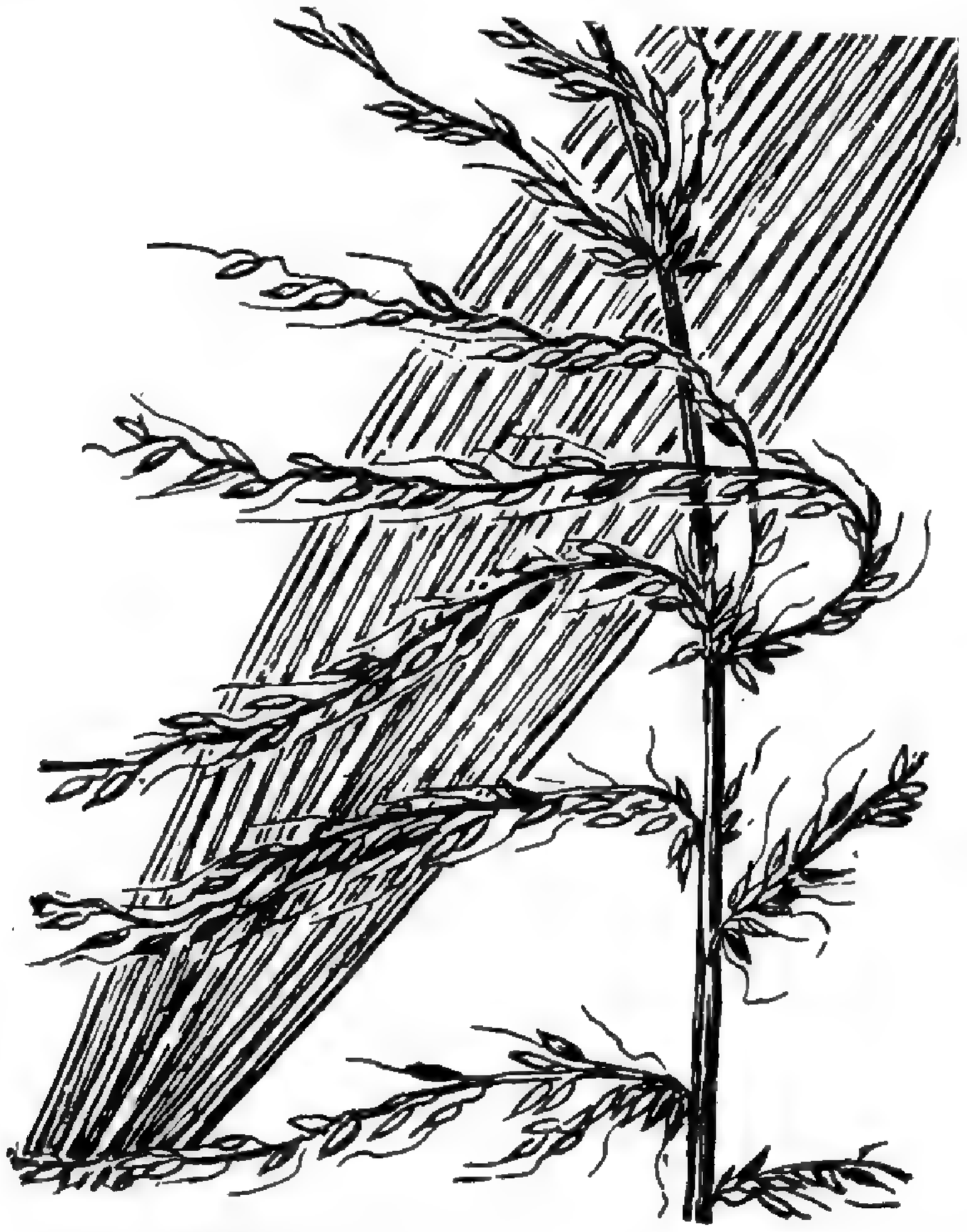

FIG. 39.—*Chaetochloa sulcata*. From *Collins & Goll* 09, Guatemala.

COSTA RICA: Alajuelita, *Jiménez* 402. Turrialba, *Tonduz* 9009. Río Tuís, *Tonduz* 11394. Limón, *Hitchcock* 8412. Alajuela, *Jiménez* 133. Río Segundo, *Jiménez* 410. Puntarenas, *Pittier* 470. Puerto Viejo, *Biolley* 7468.

PANAMA: Culebra, *Hitchcock* 7935, 8122. Bohio, *Hitchcock* 8391. Gamboa, *Pittier* 6800.

LEEWARD ISLANDS: Guadeloupe, *Duss* 3185. Dominica, *Jones* 3.

WINDWARD ISLANDS: Martinique, *Duss* 4656. Grenada, *Broadway* in 1905.

TOBAGO: *Hitchcock* 10276, *Eggers* 5682.

COLOMBIA: Santa Marta, *Smith* 115.

VENEZUELA: La Guaira, *Rose* 21696. Carayaca, *Jahn* 308, 330.

CHAETOCHLOA PROPER.

Annual or perennial, low or moderately tall grasses with narrow blades (usually not over 2 cm. wide). Bristles usually below all the spikelets. Spikelets clustered on the short branches of the narrow or spikelike, rarely open panicle, the lower branches appressed or ascending, rarely more than 1 to 2 cm. long (the lower branches spreading and as much as 5 cm. long in some specimens of *C. setosa*). Fertile lemma obtuse or acutish, sometimes very turgid, cross-wrinkled or rugose, rarely smooth. Warm and temperate regions of both hemispheres.

Several annual species have been introduced from Europe and are now common weeds in fields and waste places through the cooler parts of the United States, and one (*C. verticillata*) extends well into the tropics. The perennial *C. geniculata*, a native of tropical America, is also a widely distributed weed in the same area and extends well into the southern states.

5. **Chaetochloa lutescens** (Weigel) Stuntz.

Panicum lutescens Weigel, Obs. Bot. 20. 1772. Described from Pommerania, Germany.

Panicum glaucum var. *flavescens* Ell. Bot. S. C. & Ga. **1**: 113. 1816. "Everywhere except in inundated lands," probably in the vicinity of Charleston, South Carolina. Merrill,[1] who examined the specimen in the Elliott Herbarium, states that this is a yellow-awned form of *Chaetochloa glauca* [*C. lutescens*].

Panicum compressum Balb.; Steud. Nom. Bot. ed. 2. **2**: 254. 1841, as synonym of *Panicum glaucum*. The type, from Santo Domingo, collected by Bertero, is *Chaetochloa lutescens*. In the Krug and Urban Herbarium there is a piece of the type, sent by Balbis to Sprengel.

Chaetochloa lutescens Stuntz, U. S. Dept. Agr. Bur. Pl. Ind. Inv. Seeds **31**: 83. 1912. Based on *Panicum lutescens* Weigel.

Setaria lutescens Hubbard, Rhodora **18**: 232. 1916. Based on *Panicum lutescens* Weigel.

This species has been commonly known as *Panicum glaucum*, *Setaria glauca*, and *Chaetochloa glauca*. Stuntz pointed out [2] that the name *Panicum glaucum* L. should apply to the species usually known as *Pennisetum americanum* (L.) Schum., *Pennisetum typhoideum* L. Rich., or *Penicillaria spicata* Willd., commonly called in the United States pearl millet. *Panicum glaucum* L. [3] is based on a description taken from Linnaeus's Flora Zeylanica, which refers to the species of *Pennisetum* mentioned. Linnaeus, in the Species Plantarum, describes two varieties, β and γ. Variety β is later separated under the name *Panicum viride* L.[4] Variety γ, as shown in a previous paper,[5] is based on Clayton's no. 579 from Virginia, which is the same as *Panicum lutescens* Weigel, that is, what has usually been called *Panicum glaucum*. In the Systema [4] Linnaeus describes *P. glaucum*, using the words found in the description taken from the Flora Zeylanica, but adding "Seminibus undulato-rugosis", and cites "Sp. pl. n. 2 γ." He has here apparently attached the name *glaucum* to what he had previously called *glaucum* var. γ, that is, to *P. glaucum* in the subsequent sense. In the second edition of the Species Plantarum, Linnaeus uses the emended diagnosis from the Systema, citing "Fl. zeyl. 44," and adds the citation from Gronovius, giving the habitat as "Indiis & Italia." The descriptive note appended includes the statement "Setae in spica longitudine flosculorum," which applies to pearl millet, and "semina striis undulatis notata," which applies to *Panicum lutescens*, thus indicating that he confused the two species, which are very unlike in appearance. Probably Linnaeus was not familiar with either species and was attempting to reconcile descriptions.

The following synonyms are based on *Panicum glaucum* L. as to name but refer to *Chaetochloa lutescens* as to plant. No attempt has been made to include synonymy from floras of the Old World.

Pennisetum glaucum R. Br. Prod. Fl. Nov. Holl. **1**: 195. 1810.

Setaria glauca Beauv. Ess. Agrost. 51, 178. 1812.

Chamaeraphis glauca Kuntze, Rev. Gen. Pl. **2**: 767. 1891.

Ixophorus glaucus Nash, Bull. Torrey Club **22**: 423. 1895.

Chaetochloa glauca Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897.

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[1] U. S. Dept. Agr. Div. Agrost. Circ. **29**: 3. 1901.

[2] Loc. cit.

[3] Sp. Pl. 56. 1753.

[4] Syst. Nat. ed. 10. **2**: 870. 1759.

[5] Hitchcock, Types of American Grasses, Contr. U. S. Nat. Herb. **12**: 117. 1908.

DESCRIPTION.

Plant annual, erect, often much branched at base, the culms becoming geniculate below, or in open ground spreading or even prostrate-spreading; culms rather succulent below, as much as 1 meter tall or in rich soil even taller, compressed below, smooth, scabrous just below the panicle; sheaths smooth, compressed-keeled; ligule a ciliate membrane about 1 mm. long; blades as much as 25 cm. long and 1 cm. wide, flat, twisted in a loose spiral, the upper surface along the upper half facing downward, acuminate-pointed, often glaucous, scabrous on the upper surface, toward the base beset with long lax hairs, glabrous beneath; panicle dense, evenly cylindric, spike-like, yellow at maturity, mostly 5 to 10 cm. long, sometimes longer, about 1 cm. thick, rounded at the summit, sometimes slightly interrupted at the base, the axis densely pubescent; branches very short, mostly less than 1 mm. long, pubescent like the axis, each branch bearing one developed spikelet and below this a cluster of short branchlets ending in bristles, sometimes a second small and undeveloped spikelet borne in one of these secondary clusters; branchlets irregular in length, mostly less than 1 mm. long, bearing 1 to several bristles, the whole cluster on each branch being usually more than 5 and sometimes more than 20; bristles antrorsely scabrous, yellow, irregular in length, the longer ones 2 to 3 times as long as the spikelet; spikelets about 3 mm. long, flat on one side, strongly convex on the other, oval in outline but slightly narrowed toward the apex; first glume ovate, about half as long as spikelet, pale, with 3 strong green nerves and an outer inconspicuous pair; second glume about two-thirds as long as the spikelet, with 5 strong nerves and 1 or 2 additional weaker pairs; sterile lemma about as long as the spikelet, 5-nerved, the base embracing the edges of the fertile lemma for about half way, containing a well-developed palea but no stamens; fertile floret strongly marked with numerous transverse ridges.

This species can be distinguished from *Chaetochloa geniculata*, its closest relative, by its annual duration, and by the thicker, more succulent base of the stem; and from *C. viridis*, a common accompanying weedy species, by the color and shape of the mature panicle, and by the twisted blades.

Commonly known as yellow foxtail, sometimes as pigeon grass.

DISTRIBUTION.

A common weed in cultivated soil and waste places in the eastern states; introduced from Europe; now widely distributed in temperate regions, rare in the Tropics.

ONTARIO: Galt, *Herriot* 71. Kingston, *Fowler* in 1897.

NEW BRUNSWICK: Shediac Cape, *Hubbard* 759.

BRITISH COLUMBIA: Sicamous, *Macoun* 7.

MAINE: Westbrook, *Ricker* 579. East Auburn, *Merrill* 14. Bangor, *Knight* 20, 22. Orono, *Harvey* 1251. Augusta, *Scribner* in 1869.

NEW HAMPSHIRE: Jaffrey, *Robinson* 284.

VERMONT: Manchester, *Day* 208. Rutland, *Kirk* 1026.

MASSACHUSETTS: South Hadley, *Clark* in 1887. Townsend, *Fletcher*. Boston, *Hitchcock* in 1903. Barrington, *Pollard* in 1894.

CONNECTICUT: South Glastonbury, *Wilson* 1263.

NEW YORK: North Hannibal, *Pearce* in 1883. Shushan, *Dobbin* 6. Oxford, *Coville* in 1884.

NEW JERSEY: Weehawken, *Kearney* in 1894; *Van Sickle* in 1895. Camden, *Parker* in 1863.

PENNSYLVANIA: Easton, *Porter* in 1896. Conewago, *Small* in 1888. Philadelphia, *Scribner* in 1878. Lancaster, *Heller* 4818. Chester County, *Wendle* in 1901.

OHIO: Cincinnati, *Lloyd* 3614. Sandusky, *Morris* A140. Oberlin, *Ricksecker* in 1894.

INDIANA: Lafayette, *Dorner* 73.

ILLINOIS: Glasford, *Wilcox* 176. Jackson County, *French* in 1905. Naperville, *Umbach* in 1895. Chicago, *Gates* in 1905. Wady Petra, *V. H. Chase* 76.

WISCONSIN: Oshkosh, *Random* in 1896.
MINNESOTA: Duluth, *Hitchcock* 5090.
SOUTH DAKOTA: Highmore, *Carter* 6. Yankton, *Bruce* 11. Redfield, *Griffiths* 221. Frankfort, *Griffiths* 54. Bellefourche, *Griffiths* 366.

FIG. 40.—*Chaetochloa lutescens*. From *Chase* 2986, District of Columbia.

IOWA: Ames, *Pammel Amer. Weeds* 50; *Ball* 180. Keokuk, *Shimek* 52. Fayette County, *Fink* 274.
MISSOURI: St. Louis, *Eggert* 266. Aberdeen, *Davis* 934. Courtney, *Bush* 818, 1670. Springfield, *Standley* 8331.
KANSAS: Riley County, *Norton* 575.
DELAWARE: Stanton, *Commons* 146.

MARYLAND: Garrett County, *Smith* in 1879. Hyattsville, *Scribner* in 1888.
DISTRICT OF COLUMBIA: *Merrill* 172; *Vasey* in 1885; *Chase* 2986.
VIRGINIA: Princess Anne County, *Kearney* 2158.
NORTH CAROLINA: Magnetic City, *Wetherby* 8.
SOUTH CAROLINA: Orangeburg, *Hitchcock* in 1905.
FLORIDA: Quincy, *Combs* 396.
TENNESSEE: Knoxville, *Scribner*.
ALABAMA: Selma, *McCarthy* in 1888. Eufaula, *McCarthy* in 1888.
LOUISIANA: Baton Rouge, *Hitchcock* in 1904. Alexandria, *Ball* 487. Burnside, *Combs* 1409. Shreveport, *Ball* 97. Rayville, *Ball* 23a. Calhoun, *Ball* 44.
TEXAS: Big Spring, *Hitchcock* 13406. Abilene, *Bentley* in 1899.
OKLAHOMA: Verdigris, *Bush* 743.
OREGON: Ontario, *Griffiths & Morris* 937. Albina, *Suksdorf* 2885. Linnton, *Suksdorf* 1684.
NEW MEXICO: Mesilla Park, *Standley* in 1906.
CALIFORNIA: Threerivers, *Jepson* 4718.
JAMAICA: Cinchona, *Hitchcock* 9702; *Harris* 11272, 11457; *Hart* 740.

6. **Chaetochloa geniculata** (Lam.) Millsp. & Chase.

Panicum geniculatum Lam. Encycl. **4:** 727 (err. typ. 737). 1798. "Je l'ai vue depuis dans un herbier fait aux Antilles, & particuliérment à la Guadeloupe." Lamarck distinguishes this from *Panicum glaucum* by the short bristles and glabrous leaves. The type has not been examined.

Cenchrus parviflorus Poir. in Lam. Encyl. **6:** 52. 1804. "Cette plante croît à Porto Ricco. Elle a été communiquée à M. Lamarck par M. Ventenat." See remarks under *Setaria ventenatii*.

Setaria geniculata Beauv. Ess. Agrost. 51, 178. 1812. Based on *Panicum geniculatum*. Beauvois includes the latter name among the species of *Panicum* referred to *Setaria*. In the index, under *Setaria*, the name *geniculata* appears with a question.

Pennisetum geniculatum Jacq. Eclog. Gram. **3:** *pl. 26*. 1815–1820. Based on *Panicum geniculatum* Hornem. Cat. Hort. Hafn. 28; Willd. Enum. Pl. **2:** 1031. 1809. The name is not published as new by Hornemann or Willdenow.

Setaria gracilis H. B. K. Nov. Gen. & Sp. **1:** 109. 1816. "Crescit locis alsis, opacatis inter Fusagasuga et Pandi inter 520 et 920 hexap. (Regno Novogranatensi)." The type has not been examined, but the description identifies it as a slender-panicled form of *C. geniculata*.

Setaria purpurascens H. B. K. Nov. Gen. & Sp. **1:** 110. 1816. "Quitensis prope Chillo, in radicibus montis Turubamba." In the text this species is placed next to *S. glauca* [*lutescens*], but it is stated that it is allied to *S. viridis*. The description states that the bristles are "fuscescentes." A portion of the type has been examined at the Trinius Herbarium. It was marked "Ex herb. Humb."

Panicum imberbe Poir. in Lam. Encycl. Suppl. **4:** 272. 1816. "In America septentrionali & Brasilia." The species is distinguished from "*P. glaucum*" [*lutescens*] by the absence of hairs on the leaves and at the mouth of the sheath. The type has not been examined.

? *Panicum pumilum* Poir. in Lam. Encycl. Suppl. **4:** 273. 1816. The origin of the specimen, seen by Poiret in the Desfontaines Herbarium, is stated to be unknown. The type has not been examined by the writer and the name is referred to *Chaetochloa geniculata* with doubt.

Panicum laevigatum Muhl.; Ell. Bot. S. C. & Ga. **1:** 112. 1816. "Grows on sea islands (on Edings' plentifully), along margins of the salt water." The type is in Muhlenberg's herbarium at the Philadelphia Academy.[1] Elliott's specimen, labeled

[1] U. S. Dept. Agr. Div. Agrost. Circ. **27:** 2. 1900.

"*Panicum glaberrimum*. Hab. juxta littor. maritima," is a long-awned form without base.

Panicum glaucum var. *purpurascens* Ell. Bot. S. C. & Ga. **1**: 113. 1816. This is stated by Merrill [1] to be a short-awned form of *Chaetochloa imberbis* [*C. geniculata*].

Setaria imberbis Roem. & Schult. Syst. Veg. **2**: 891. 1817. Based on *Panicum imberbe* Poir.

Pennisetum laevigatum Nutt. Gen. Pl. **1**: 55. 1818. Based on *Panicum laevigatum* Ell.

Setaria laevigata Schult. Mant. **2**: 275. 1824. Based on *Panicum laevigatum* Muhl.

Setaria affinis Schult. Mant. **2**: 276. 1824. Based on "Panicum n. 4. (sine nomine). Muhlenb. Descr. uber. p. 101." "Habitat in Georgia et Pennsylvania." The type is in the Muhlenberg Herbarium.

Setaria berteroniana Schult. Mant. **2**: 276. 1824. The specimen was collected in Santo Domingo by Bertero. Schultes describes it in a note under *Setaria corrugata*. The type has not been examined but the description, "setis 9–12," together with the locality, leaves no doubt as to the identity of the species.

Panicum flavum Nees, Agrost. Bras. 238. 1829. "Habitat in campis graminosis provinciae Piauhiensis, tum in campis ad Joazeiro provinciae Pernambucensis et Bahiensis." The Pernambuco specimen has been examined in the Munich Herbarium.

Panicum imberbe β *pumilum* Nees, Agrost. Bras. 240. 1829. Based on *Panicum pumilum* Poir., which is uncertain, but the plant described by Nees appears to be *Chaetochloa geniculata*.

Panicum fuscescens Willd.; Nees, Agrost. Bras. 241. 1829, as synonym under *P. purpurascens*. The type has been examined in the Willdenow Herbarium.

Panicum dasyurum Nees, Agrost. Bras. 241. 1829. "Habitat in Brasilia. (Comes a Hoffmannsegg) (Vidi in Herb. Willd.)—Ad Monte Video legit Sellow (Vidi in Herb. Reg. Berol.)." The first specimen has been examined in the Willdenow Herbarium. A specimen of the Sellow collection is in the National Herbarium.

Panicum penicillatum Willd.; Nees, Agrost. Bras. 242. 1829. Not *Panicum penicillatum* Nees, op. cit. 145. "In Brasilia, ad Rio de Janeiro (Raddi); in Monte Video (Sellow.) (Vidi in Herb. Willd.)." The bristles are described as being 4 times as long as the spikelets. A duplicate of the Sellow collection cited is in the National Herbarium. The label reads "*Panicum penicillatum* W. herb. N. v. E. Bras."

Panicum tejucense Nees, Agrost. Bras. 243. 1829. "Habitat in districtu Adamantum prope Tejuco et aliis in locis provinciae Minarum generalium." The type has been examined at the Munich Herbarium.

Setaria flava Kunth, Rév. Gram. **1**: 46. 1829. Based on *Panicum flavum* Nees.

Setaria ventenatii Kunth, Rév. Gram. **1**: 251. *pl. 37*. 1830. "Crescit in Portorico et ? Hispaniola." Kunth gives as synonym *Cenchrus parviflorus* Poir., and states that he has not seen the original specimen of this, but as Poiret says he saw the specimen in the herbarium of Ventenat, "ou je n'ai trouvé parmi les Cenchrus qu'une seule plante originaire de Portorico, qui est mon *Setaria ventenatii*," it seems probable to him that the two names refer to the same specimen. The nodes are described by Kunth as pubescent, but in the plate they are glabrous. The bristles are described as long (5 times as long as the spikelets) and purple. The type specimen has been examined in the Berlin Herbarium. It is a narrow-leaved form with several rather small panicles.

Setaria tejucensis Kunth, Rév. Gram. **1**: Suppl. XI. 1830. Based on *Panicum tejucense* Nees.

Setaria penicillata Presl, Rel. Haenk. **1**: 314. 1830. Based on *Panicum penicillatum* Willd.

Panicum ventenatii Steud. Nom. Bot. ed. 2. **2**: 265. 1841. Based on *Setaria ventenatii* Kunth.

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[1] U. S. Dept. Agr. Div. Agrost. Circ. **29**: 3. 1901.

Panicum berteronianum Steud. Syn. Pl. Glum. **1**: 50. 1854. Based on *Setaria berteroniana* Schult.

Panicum psilocaulum Steud. Syn. Pl. Glum. **1**: 50. 1854. "*P. glaucum* var. Trin. Ic. t. 196 A. *P. imberbe* Poir sec. Trin. *Setaria gracilis* H.B. * * * Am. austr." It is probable that the description is based on the Brazilian specimen which was the plant from which Trinius's plate is drawn. Trinius says that figure A is *Setaria gracilis* Kunth. The name is changed, doubtless, because of the earlier *Panicum gracile* R. Br.

Setaria glauca var. *laevigata* Chapm. Fl. South. U. S. 578. 1860. Based on *Panicum laevigatum* Ell.

Setaria glauca β *imberbis* Griseb. Fl. Brit. W. Ind. 554. 1864. Based on *Panicum imberbe* Poir.

Setaria glauca γ *penicillata* Griseb. Fl. Brit. W. Ind. 554. 1864. Based on *Panicum penicillatum* "W., Tr.," which is *P. penicillatum* Willd.

Panicum imberbe β *purpurascens* Doell in Mart. Fl. Bras. **2**²: 157. 1877. Based on *Panicum purpurascens* H. B. K.

Panicum imberbe γ *latifolium* Doell in Mart. Fl. Bras. **2**²: 157. 1877. Several specimens are cited, the first of which is *Gardner* 3516. One of the cited specimens (*Regnell* III. 1372) is in the National Herbarium.

Panicum virescens Salzm.; Doell in Mart. Fl. Bras. **2**²: 157. 1877, as synonym of *P. imberbe* γ *latifolium*.

Panicum glaucescens Salzm.; Doell in Mart. Fl. Bras. **2**²: 157. 1877, as synonym of *P. imberbe* γ *latifolium*.

Panicum imberbe δ *dasyurum* Doell in Mart. Fl. Bras. **2**²: 157. 1877. Based on *Panicum dasyurum* Nees.

Setaria streptobotrys Fourn. Mex. Pl. **2**: 47. 1886. Several specimens are cited, the first being *Galeotti* 5832 from Real del Monte. This specimen has not been examined, but two of the others have been seen (*Bourgeau* 231, *Liebmann* 345).

Chamaeraphis glauca var. *penicillata* "Gris. (W.);" Kuntze, Rev. Gen. Pl. **2**: 767. 1891. Based on *Panicum pencillatum* Willd.

Chamaeraphis glauca var. *imberbis* "Trin. (Poir.);" Kuntze, Rev. Gen. Pl. **2**: 767. 1891. Based on *Panicum imberbe* Poir.

Setaria perennis Hall; Smyth, Check List Pl. Kans. 26. 1892; Trans. Kans. Acad. **13**: 102. 1893. "Frequent in damp alkaline and saline bottoms in central and southwestern Kansas." The relation of Hall to this species is not clear. The name does not appear in E. Hall's Plantae Texanae (1873). The type specimen, now in the National Herbarium, was collected at Hutchinson, Kansas, by B. B. Smyth in 1890.

Setaria gracilis β *purpurascens* Arech. Anal. Mus. Nac. Montevideo **1**: 164. 1894. Based on *Panicum purpurascens* H. B. K.

Setaria gracilis γ *latifolia* Arech. Anal. Mus. Nac. Montevideo **1**: 165. 1894. Based on *Panicum imberbe* γ *latifolium* Doell, inasmuch as *Panicum virescens* and *P. glaucescens* Salzm. are given as synonyms (see notes on these names).

Setaria gracilis ε *dasyura* Arech. Anal. Mus. Nac. Montevideo **1**: 165. 1894. Based on *Panicum dasyurum* Nees.

Chamaeraphis ventenatii Beal, Grasses N. Amer. **2**: 153. 1896. Based on *Setaria ventenatii* Kunth.

Chamaeraphis glauca var. *laevigata* Beal, Grasses N. Amer. **2**: 155. 1896. Based on *Panicum laevigatum* Muhl.

Chamaeraphis glauca var. *perennis* Beal, Grasses N. Amer. **2**: 156. 1896. "Florida, *Curtiss* 3614*." Curtiss is given in parenthesis as author of the varietal name. *Curtiss* 3614* bears a printed label with the name "*Setaria glauca* Beauv. var. *perennis*." No date is given. There is nothing to connect this with *S. perennis* Hall.

Chamaeraphis glauca var. *geniculata* Beal, Grasses N. Amer. **2**: 156. 1896. Based on *Panicum geniculatum* Lam.

Chaetochloa imberbis Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897. Based on *Panicum imberbe* Poir.

Chaetochloa penicillata Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897. Based on *Panicum penicillatum* Willd.

Chaetochloa flava Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897. Based on *Panicum flavum* Nees.

Chaetochloa versicolor Bicknell, Bull. Torrey Club **25**: 105. *pl. 329*. 1898. "Borders of salt and brackish marshes, Van Cortlandt Park and Kingsbridge, New York City." The type specimen, in the New York Botanical Garden Herbarium, was collected by Bicknell at Kingsbridge.

Chaetochloa perennis Bicknell, Bull. Torrey Club **25**: 107. 1898. Based on "*C. glauca* var. *perennis* Curtiss in Beal's Grasses of North America **2**: 156. 1896."

Chaetochloa laevigata Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 10. 1900, as synonym of *Chaetochloa imberbis* Scribn.

Chaetochloa imberbis perennis Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 12. 1900. Based on *Setaria perennis* Hall.

Chaetochloa imberbis geniculata Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 12. 1900. Based on *Panicum geniculatum* Lam.

Chaetochloa imberbis streptobotrys Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 13. 1900. Based on *Setaria streptobotrys* Fourn.

Chaetochloa purpurascens Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 13. 1900. Based on *Setaria purpurascens* H. B. K.

Chaetochloa gracilis Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 15. 1900. Based on *Setaria gracilis* H. B. K.

Chaetochloa corrugata parviflora Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 24. 1900. The name is based upon *Cenchrus parviflorus* Poir. (*Chaetochloa geniculata*). The plants cited all belong to *Chaetochloa corrugata.*

Panicum glaberrimum Ell.; Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Circ. **29**: 3. 1901, as synonym of *Chaetochloa imberbis.*

Chaetochloa ventenatii Nash in Kearney, Contr. U. S. Nat. Herb. **5**: 515. 1901. Based on *Setaria ventenatii* Kunth.

Chaetochloa occidentalis Nash in Britton, Man. 90. 1901. "In meadows, Kans. and Ind. Terr." The type is a different specimen of the same collection as the type of *Setaria perennis* Hall. The specimen is in the herbarium of the New York Botanical Garden.

Setaria glauca γ *geniculata* Urban, Symb. Antill. **4**: 96. 1903. Based on *Panicum geniculatum* Lam.

Setaria glauca δ *purpurascens* Urban, Symb. Antill. **4**: 96. 1903. Based on *Setaria purpurascens* H. B. K.

Chaetochloa geniculata Millsp. & Chase, Field Mus. Bot. **3**: 37. 1903. Based on *Panicum geniculatum* Lam.

Chamaeraphis imberbis Kuntze; Stuck. Anal. Mus. Nac. Buenos Aires **11**: 76. 1904, footnote. Based on *Panicum imberbe* Poir. Stuckert says that Kuntze and Post affirm that the name *Chamaeraphis* has priority over *Setaria.* On the authority of those authors he lists his Argentine species under *Chamaeraphis*, giving Kuntze as author of the combination.

Chamaeraphis gracilis Kuntze; Stuck. Anal. Mus. Nac. Buenos Aires **11**: 76. 1904, in footnote. Based on *Setaria gracilis* H. B. K.

Chamaeraphis penicillata Presl; Stuck. Anal. Mus. Nac. Buenos Aires **11**: 76. 1904. Presumably based on *Setaria penicillata* Presl, though no synonym is cited.

Panicum versicolor Nieuwl. Amer. Midl. Nat. **2**: 64. 1911. Not *Panicum versicolor* Doell, 1877. Based on *Chaetochloa versicolor* Bicknell.

Panicum occidentale Nieuwl. Amer. Midl. Nat. **2**: 64. 1911. Not *Panicum occidentale* Scribn. 1899. Based on *Chaetochloa occidentalis* Nash.

DESCRIPTION.

Plants perennial, producing short knotty branching rhizomes as much as 4 cm. long; culms erect, spreading, or prostrate, tufted or solitary, as much as 1 meter tall, sometimes dwarfed, glabrous, usually scabrous below the panicle, the base usually hard and wiry, often more slender than the upper part; sheaths compressed-keeled, glabrous, sometimes scabrous toward the summit; ligule very short, densely ciliate; blades flat, scabrous, often glaucous, and often more or less villous toward the base on the upper surface, glabrous or somewhat scabrous beneath, mainly straight (not twisted as in *C. lutescens*), as much as 20 cm. long and 8 mm. wide, usually narrower and shorter than this; panicle long-exserted, erect, evenly cylindric, densely flowered, rounded or truncate (not narrowed) at summit, 1 to 10 cm. long or in robust specimens longer, 4 to 8 mm. thick (excluding the bristles), yellow, purple, tawny, or greenish, the axis densely and softly pubescent; branches pubescent like the axis, very short, about 1 mm. long to the single spikelet, bearing about the middle a fascicle of irregular branchlets, almost immediately dividing into bristles; bristles several, mostly 8 to 12, yellow or purple, 1 to 3 times or even as much as 6 times as long as the spikelets, antrorsely scabrous; spikelets 2 to 2.5 or even 3 mm. long, ovoid, plano-convex; first glume about one-third as long as spikelet, 3-nerved; second glume half to two-thirds as long as spikelet, 5-nerved; sterile lemma staminate or neuter, as long as the spikelet, 5 to 7-nerved, the palea well developed; fertile lemma transversely rugose with close narrow ridges.

FIG. 41.—*Chaetochloa geniculata*. From *Chase* 2981, Maryland.

This species is exceedingly variable, but after study of a great amount of material and much field work it is impossible to segregate coherent groups. The culms are sometimes single, slender, and weak, sometimes cespitose, sometimes stout, much branched at base, spreading or prostrate; the blades vary in width, and the panicles in length. Much of the difference in general appearance is due to the color and length of the bristles. The bristles are long early in the season and in cultivated soil. The differences appear not to be coordinated. In occasional specimens the sterile lemma is indurate and rugose like the fertile lemma (Fort Myers, Florida, *Hitchcock* 512; Virginia Beach, Virginia, *Hitchcock* 78).

Sometimes the blades are very narrow, only 2 to 3 mm. wide, but otherwise the form is not distinct (CALIFORNIA: Fresno, *Griffiths* 4717. Pomona, *Hitchcock* in 1903. Riverside, *Reed* 1186. MEXICO: Monterrey, *Hitchcock* 55603). This has been called *C. gracilis*.[1]

In *Funck & Schlim* 722 from Colombia (N. Y. Bot Gard. Herb.) the blades are densely pilose on the upper surface and sparsely so beneath.

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[1] U. S. Dept. Agr. Div. Agrost. Bull. **21**: 15. 1900; Hitchcock, Mexican Grasses. Contr. U. S. Nat. Herb. **17**: 263. 1913.

DISTRIBUTION.

Open ground, pastures, cultivated soil, salt marshes, and moist ground along the coast, Connecticut to Florida and Texas, in the interior north to Kansas, south through tropical America to Argentina and Chile.

CONNECTICUT: Groton, *Bissell* in 1905. Green Farms, *Bicknell* in 1897.

NEW YORK: Orient, *Dobbin* 9.

NEW JERSEY: Lambertville, *Fisher* in 1901 and 1904. Califon, *Fisher* in 1901.

PENNSYLVANIA: Chester County, *Windle* in 1901. Philadelphia, *Smith* 64.

MISSOURI: Alba, *Bush* 6071. Campbell, *Bush* 6294, 6294A, 6294C. Monteer, *Bush* 6090. Smithfield, *Bush* 6016, 6016A, 6016B. Webb City, *Bush* 6044, 6044A.

KANSAS: Comanche County, *Hitchcock* 885, 1544. Hutchinson, *Smyth* in 1890.

MARYLAND: West Chevy Chase, *Hitchcock* in 1905; *Chase* 2981. Riverdale, *Maxon & Norton* 14. Owings, *Hitchcock* 1620. Millstone, *Hitchcock* 7880. Bay Ridge, *Scribner* in 1897. Chesapeake Junction, *Hitchcock* 1645.

DISTRICT OF COLUMBIA: *Steele* in 1898; *Ball* 60, 63; *Chase* 2990.

VIRGINIA: Lynnhaven, *Chase* 2943. Dismal Swamp, *Chase* 3681; *McCarthy* in 1883. Alexandria, *House* 412. Jackson City, *Steele* in 1898. Virginia Beach, *Hitchcock* in 1905; *Kearney* 2035. Suffolk, *Kearney* 1735.

WEST VIRGINIA: Aurora, *Steele* in 1898.

NORTH CAROLINA: Ocracoke Island, *Kearney* 2277. Wilmington, *Chase* 7199. Biltmore, *Norton* 332; *Biltmore Herb.* 6026a. West Raleigh, *Stanton* 1290.

SOUTH CAROLINA: Orangeburg, *Hitchcock* 162. Beaufort, *Chase* 7118. Florence, *Ball* 685. Aiken, *Ravenel* in 1869.

GEORGIA: Brunswick, *Chase* 7090. Augusta, *Kearney* 200, 227. St. Simons Island, *Ricker* 961. Savannah, *Kearney* 186.

FLORIDA: Jacksonville, *Curtiss* 4745, 5411, 6646; *Combs* 13, 19. Bartow, *Combs* 1232. Madison, *Combs* 237, 264. Ellzey, *Combs* 826. Homosassa, *Combs* 924, 935½, 969. Manatee, *Biltmore Herb.* 6027. Fort Myers, *Hitchcock* 511, 512, 513, 514, 516, 901; *J. P. Standley* 147, 241; *Standley* 12860. Miami, *Hitchcock* 485, 498, 651, 709; *Chase* 3888. De Soto County, *Fredholm* 6225. Lake City, *Hitchcock* 2348; *Combs* 79, 179; *Rolfs* 862; *Bitting* 779. Hernando County, *Hitchcock* 2349. Jefferson County, *Hitchcock*, 2344, 2350. Levy County, *Hitchcock* 2346. Alachua County, *Hitchcock* 2347; *Combs* 702. Eustis, *Nash* 566; *Hitchcock* 2345. Washington County, *Combs* 659. Sanibel Island, *Hitchcock* 515. Pine Island, *Tracy* 7206. Manavista, *Tracy* 6696. Perico Island, *Tracy* 6707. Orange County, *Fredholm* 5440. Duval County, *Curtiss* 3614*. Monticello, *Combs* 346. Old Town, *Combs* 877. Flamingo, *Eaton* 1324. Quincy, *Combs* 396. Hillsborough County, *Fredholm* 6398. Brevard County, *Fredholm* 6152. Marco, *Hitchcock* in 1900. St. Vincent Island, *McAtee* 1693, 1761, 1848A. Key Largo, *Chase* 3933. Apalachicola, *Kearney* 116. Cedar Key, *Combs* 775, 794; *Tracy* 7179. Archer, *Quaintance* 824. Orange Glade, *Eaton* 568. Punta Rassa, *Hitchcock* in 1900. Dade County, *Small, Mosier & Small* 6426, 6871, 6876. Pablo Beach, *Chase* 7045. St. Marks, *Harper* 214. Key West, *Hitchcock* 610. Fellsmere, *Tracy* 9256. Without locality, *Rugel* 293, 437.

TENNESSEE: Bluff City, *Hitchcock* in 1905. Bristol, *Hitchcock* in 1905. Vances Station, *Hitchcock* 96.

ALABAMA: Mobile, *Mohr* in 1881. Cullman County, *Eggert* 18. Mobile, *Kearney* 19, 42, 58; *Mohr* in 1885 and 1891. Sylacauga, *Pollard & Maxon* 217. Talladega Springs, *Pollard & Maxon* 245.

MISSISSIPPI: Chandelier Island, *Tracy* in 1897. Biloxi, *Tracy* 4532, 6467, 6468; *Kearney* 217. Petit Bois Island, *Tracy* in 1898. Starkville, *Chase* 4448; *Kearney* 22. Agricultural College, *Kearney* 34; *Ricker* 848. Ocean Springs, *Pollard* 1105. Morton, *Holt* 49.

LOUISIANA: Alexandria, *Ball* 185. Calhoun, *Ball* 41. Coushatta, *Ball* 132. Houma, *Wurzlow* in 1914. Isle au Pied, *Tracy & Lloyd* 456. Lake Charles, *Allison* 259; *Chase* 6092. New Orleans, *Kearney* 343. Oberlin, *Ball* 218. Pointe a la Hache, *Langlois* 54, 147. Port Eads, *Tracy & Lloyd* 458.

TEXAS: Terrell, *Warburton* in 1904. Houston, *Fisher* 1721. Bexar County, *Jermy* 23, 207, 227. Clarksville, *Plank* 13. Galveston, *Bebb* 1098; *Hitchcock* in 1903; *Plank* 84. San Antonio, *Ball* 938; *Hitchcock* 5131, 5155. Dallas, *Reverchon* 1098. Columbia, *Bush* 926. Del Rio, *Hitchcock* 13624, 13656; *Plank* 61. Cold Creek, *Bigelow*, (Whipple's Expl.). Guadalupe Mountains, *Havard* in 1881. Brownsville, *Hitchcock* 5411. New Braunfels, *Hitchcock* 5232. Taylor, *Ball* in 1901. Corpus Christi, *Hitchcock* 5374; *Nealley* 27. Ennis, *Smith* in 1897. Huntsville, *Plank* 64. Hempsted, *Hall* 840 in part. Home Canyon, *Carleton* 423. Kingsville, *Tracy* 8883. Kerrville, *Heller* 1889. Pinto Creek, *Hill* 82.

OKLAHOMA: Choctaw Agency, *Bigelow* (Whipple's Expl.). Fort Cobb, *Palmer* 374.

NEW MEXICO: Kingston, *Metcalfe* 1195.

CALIFORNIA: Chico, *Ball* 1948. Fresno, *Griffiths* 4717. Los Angeles, *Davidson* 3260, 3261. Pomona, *Hitchcock* in 1903. Riverside, *Reed* 1186; *Wilder* 1043, 1127.

LOWER CALIFORNIA: San José del Cabo, *Brandegee* 15 in 1890; *Purpus* 325.

SONORA: Hermosillo, *Hitchcock* 3586, 3587, 3618, 3625; *Maltby* 241; *Rose* 12496.

CHIHUAHUA: Chihuahua, *Palmer* in 1885. Sánchez, *Hitchcock* 7691.

COAHUILA: Jimulco Springs, *Pringle* 431. Saltillo, *Hitchcock* 5583, 5610, 5650; *Palmer* 383 and 384 in 1898.

NUEVO LEÓN: Monterrey, *Hitchcock* 5560, 5570.

TAMAULIPAS: Tampico, *Hitchcock* 5797; *Palmer* 149 in 1910. Victoria, *Palmer* 393 and 556 in 1907.

SAN LUIS POTOSÍ: Cárdenas, *Hitchcock* 5720, 5722. Las Canoas, *Hitchcock* 5761. San Luis Potosí, *Hitchcock* 5669; *Schaffner* 171, 1041.

DURANGO: Durango, *Hitchcock* 7593; *Palmer* 378, 381 and 539 in 1896. Tejamén, *Palmer* 499 and 539 in 1906. Tepehuanes, *Palmer* 263 in 1906.

SINALOA: Lodiego, *Palmer* 1648 in 1891.

TEPIC: Santa Teresa, *Rose* 3417.

JALISCO: Colotlán, *Rose* 3607. Guadalajara, *Palmer* 293 in 1886. Río Blanco, *Palmer* 246 in 1886. San Nicolás, *Hitchcock* 7184. Zapotlán, *Hitchcock* 7128, 7142, 7239.

AGUASCALIENTES: Aguascalientes, *Hitchcock* 7455.

GUANAJUATO: Acámbaro, *Hitchcock* 6945, 6953. Irapuato, *Hitchcock* 7401.

QUERÉTARO: Querétaro, *Arsène* 10271; *Basile* 45, 46; *Hitchcock* 5821, 5849.

HIDALGO: Ixmiquilpan, *Rose* 9056. Pachuca, *Hitchcock* 6712, 6726; *Rose* 8723.

VERACRUZ: Córdoba, *Finck* 5; *Hitchcock* 6398. Colipa, *Karwinsky* 959; *Liebmann* 360. Jalapa, *Hitchcock* 6593, 6594, 6623; *Smith* 1547. Mirador, *Liebmann* 354. Orizaba, *Botteri* 157, 631, 673; *Hitchcock* 6320, 6327, 6349, 6365, 6370; *Nelson* 33. Potrero de San Sebastián, *Liebmann* 352. Sanborn, *Orcutt* 3237. Veracruz, *Hitchcock* 6550, 6573; *Purpus* 6210. Morro de Boquilla, *Liebmann* 353.

PUEBLA: Acatzingo, *Nicolás* in 1909. Chalchicomula, *Hitchcock* 6278. Puebla, *Arsène* 331; *Nicolás* in 1909. San Marcos, *Hitchcock* 6511. Tehuacán, *Hitchcock* 6042. Tochimilco, *Nelson* in 1893.

FEDERAL DISTRICT: *Bourgeau* 231; *Hitchcock* 5883, 5923, 5944; *Holway* 7, 3126, 3556; *Orcutt* 3534, 3613; *Pringle* 6419, 7171, 11220. Toluca, *Hitchcock* 6898. Popo Park, *Hitchcock* 6016.

MORELOS: Cuernavaca, *Hitchcock* 6832; *Pringle* 7172, 7173. Cuantla, *Pringle* 9587. El Parque, *Orcutt* 3861.

MICHOACÁN: Morelia, *Arsène* in 1909. Uruapan, *Hitchcock* 6959, 6986.

COLIMA: Alzada, *Hitchcock* 7076; *Orcutt* 4624. Colima, *Palmer* 17 in 1897.

GUERRERO: Iguala, *Rose* 9388.

OAXACA: Cuicatlán, *Nelson* 1652, 1907. Las Sedas, *Smith* 935. Oaxaca, *Conzatti & González* 342; *Hitchcock* 6147, 6157, 6176. Plunia, *Nelson* 2482. Sierra, *Galeotti*

5883. Tomellín, *Hitchcock* 6210, 6223; *Rose* 10063. Totontepec, *Nelson* 710. Chinantla, *Liebmann* 350, 351.

CHIAPAS: Ocuilapa, *Nelson* 3023a. Turubula, *Nelson* 3336.

YUCATÁN: Izamal, *Gaumer* 756.

QUINTANA ROO: Chichankanab, *Gaumer* 1938.

MEXICO (Republic of): Without locality, *Liebmann* 349 and 355.

GUATEMALA: Copán, *Pittier* 1795, 1806a. Cubilquitz, *Türckheim* 7695. Escuintla, *Hitchcock* 9004. Finca Sepacuité, *Cook & Griggs* 659; *Collins & Goll* 04. Fiscal, *Deam* 6168. Gualán, *Deam* 422. Guatemala City, *Hitchcock* 9025; *Popenoe* 668. Patalul, *Kellerman* 5699. Puerto Barrios, *Kellerman* 4787. San Rafael, *Holway* 24. Santa Rosa, *Heyde & Lux* 3909.

HONDURAS: Point Triunfo, *Wilson* 340. Ruatán Island, *Gaumer* 115. San Pedro Sula, *Thieme* 311, 341.

SALVADOR: San Salvador, *Velasco* 6, 13.

NICARAGUA: Corinto, *Hitchcock* 8756½. Masaya, *Hitchcock* 8644.

COSTA RICA: Alajuela, *Jiménez* 523. Alajuelita, *Pittier* 2997; *Tonduz* 8817. Cañas Gordas, *Pittier* 11016. Cartago, *Cooper* 156; *Pittier* 6985. Zent, *Tonduz* 213. Guanacaste, *Jiménez* 737; *Pittier* 2700. Machuca, *Pittier* 2606. Poás, *Tonduz* 10752. Port Limón, *Hitchcock* 8423. Puntarenas, *Hitchcock* 8568. Río Tuís, *Tonduz* 11400. San José, *Cooper* 5993; *Hitchcock* 8463; *Pittier* 461, 646; *Tonduz* 765, 3008. San Pedro de la Calabaza, *Pittier* 2966. Siquires, *Pittier* 4205. Surubres, *Biolley* 17380. Talamanca, *Tonduz* 9215. Tucurrique, *Tonduz* 13326. Turrialba, *Tonduz* 4093.

PANAMA: Ancón, *Killip* 4016, 4021. Cerro Vaca, *Pittier* 5344. Corozal, *Killip* 4104. Culebra, *Hitchcock* 7921; *Pittier* 4444. El Boquete, *Pittier* 3042; *Hitchcock* 8171, 8285. Empire, *Pittier* 3719. Gamboa, *Pittier* 4792. Gatún, *Hitchcock* 9173. Matías Hernández, *Pittier* 6759. New Frijoles, *Pittier* 6840. Panama, *Gervais* 166. Taboga Island, *Hitchcock* 8062.

BERMUDA: *Brown & Britton* 5; *Millspaugh* 45, 50.

BAHAMAS: Anguilla Isles, *Wilson* 7975, 8061.

CUBA: Chirigote, *Wright* 3472. Guanabacoa, *Hitchcock* in 1906. Guines, *Léon* 428. Habana, *Curtiss* 749; *Léon* 269, 832, 1964, 4182, 5212; *Tracy* 9112. Herradura, *Hitchcock* in 1906. Laguna Jovero, *Shafer* 10730. Los Palacios, *Shafer* 11795. Manacas, *Léon* 5835. Matanzas, *Wright* 3888. Punta Brava, *Baker* 4063. Sancti-Spiritus Mountains, *Léon* 6539. Guantánamo Bay, *Britton* 2172. San Diego de los Baños, *Palmer & Riley* 546. Santiago, *Léon* 833, 834. Santiago de las Vegas, *Baker* 522, 561; *Hitchcock* in 1906. Sumidero, *Shafer* 13681. Triscornia, *Hitchcock* in 1906. Woodfred, *Shafer* 3009. Isle of Pines, *Britton & Wilson* 15378; *Taylor* 45. Without locality, *Wright* in 1865, 3473 in part.

JAMAICA: Bath, *Maxon* 2368. Bog Walk, *Hitchcock* 9299. Bull Head Mountain, *Hitchcock* 9526. Castleton, *Harris* 11282. Castleton Gardens, *Hitchcock* 9399. Ewarton, *Hitchcock* 9431. Gordon Town, *Hart* 683, 684, 747. Hardware Gap, *Harris* 10902. Ipswich, *Hitchcock* 9612. Kellits, *Harris* 11156. Kingston, *Hitchcock* 9265. Lititz, *Harris* 11743, 12683. Mount Faraway, *Harris* 11382. New Forest, *Hitchcock* 9849. Port Antonio, *Maxon* 2003; *Fredholm* 3315. Ramble, *Hitchcock* 9490, 9491. Savoy, *Harris* 11617. Without locality, *March* 631.

SANTO DOMINGO: Rincón, *Fuertes* 1280. Azua, *Fuertes* 1876.

PORTO RICO: Adjuntas, *Sintenis* 4457. Aibonito, *Chase* 6342. Atola-teja, *Goll* 236. Cayo Muertos, *Britton, Cowell & Brown* 4989. Dorado, *Johnston* 893. Lares, *Chase* 6590. Lecheria, *Goll* 28. Maricao, *Britton, Cowell & Brown* 4532; *Chase* 6195, 6231½; *Sintenis* 208. Mayaguez, *Chase* 6166, 6304; *Sintenis* 6861. Mona Island, *Hess* 448. Ponce, *Chase* 6479; *Heller* 6240. San Juan, *Chase* 6374, 6377. Santurce, *Heller* 329. Sierra de Luquillo, *Chase* 6709, 6720. Without locality, *Eggers* 1327.

VIRGIN ISLANDS: St. Croix, *Ricksecker* 243, 383. St. Kitts, *Britton & Cowell* 744.
LEEWARD ISLANDS: Antigua, *Wullschlaegel*. Guadeloupe, *Duss* 2694. Dominica, *Jones* 6.
WINDWARD ISLANDS: Barbados, *Bot. Sta. Herb.* 453. St. Lucia, *Glasgow*, 5. Grenada, *Broadway* 145, 1126, and in 1904; *Smith* 829.
TRINIDAD: *Bot. Gard. Herb* 1380, 1679, 3208. St. Joseph, *Hitchcock* 10018.
TOBAGO: *Broadway* 4686; *Hitchcock* 10260.
COLOMBIA: Cauca, *Lehmann* 3284. Corinto, *Pittier* 1001. Huila, *Pittier* 1265. Palmira, *Pittier* 844, 848. Río Frío, *Pittier* 1585. Santa Marta, *Smith* 2186, 2187, 2189. Toribió, *Pittier* 1464.
VENEZUELA: Alto-Apure, *Jahn* 196. Caracas, *Pittier* 6165. Carayaca, *Jahn* 310. Dos Caminos, *Pittier* 6306. Island of Margarita, *Miller & Johnston* 181.
BRITISH GUIANA: Without locality, *Jenman* 4377; *Schomburgk* 552.
DUTCH GUIANA: Paramaribo, *Kuyper* in 1913.
BRAZIL: Bocaina, *Löfgren* 2367. Caldas, *Henschen* 1372; *Regnell* 1372. Campinas, *Campos Novaes* 1243. Franca, *Löfgren & Edwall* 2110. Goyaz, *Gardner* 3516. Jaguariahyva, *Dusén* 10965. Joazeiro, *Löfgren* 3740. Minas Geraes, *Widgren* 899 and in 1845. Monte Alegre, *Löfgren* 1167. Petropolis, *Binot* 24. Pratenhas, *Dorsett & Popenoe* 187b. Rio de Janeiro, *Wilkes Expl. Expd.* São João d'el Rey, *Dorsett & Popenoe* 285b. São João (São Paulo), *Löfgren* 3846; *Rabello & Barbosa* 736. Tamanduá, *Dusén* 7682. Without locality, *Gardner* 211, *Riedel* 1402.
PARAGUAY: Central Paraguay, *Morong* 540. Pilcomayo River, *Rojas* 54, 54a, 116, 134, 134a, 134b, 430. Sierra de Amambay, *Rojas* 9778, 10353.
URUGUAY: Montevideo, *Arechavaleta*; *Sellow* 247, 1918. Soriana, *Aplin* in 1892–93.
ECUADOR: Quito, *Hartweg* 1448: *Lehmann* 467. Without locality, *Jameson*.
BOLIVIA: Yungas, *Bang* 218, 273. Sorata, *Rusby* 222. Tarija, *Fries* 1116a.
ARGENTINA: Andalgala, *Jorgensen* 1110. Córdoba, *Stuckert* 486, 5380, 12667, 12840, 12927. Posadas, *Ekman* 658. San Teodoro, *Stuckert* 188, 558.
CHILE: Valdivia, *Philippi*.

7. **Chaetochloa tenax** (L. Rich.) Hitchc.

Panicum tenax L. Rich. Act. Soc. Hist. Nat. Paris **1**: 106. 1792. "A Cayenna missarum a Domino Le Blond." The type is in the Florence Herbarium.

Panicum impressum Nees, Agrost. Bras. 247. 1829. "Habitat in sylvis ad Villam do Rio de Contas provinciae Bahiensis." The type, collected by Martius, is in the Munich Herbarium.

Setaria impressa Kunth, Rév. Gram. **1**: Suppl. XII. 1830. Based on *Panicum impressum* Nees.

Setaria tenax Desv. Opusc. 78. 1831. Based on *Panicum tenax* L. Rich.

Panicum sphaerocarpum Salzm.; Steud. Syn. Pl. Glum. **1**: 51. 1854. Not *Panicum sphaerocarpon* Ell. 1816. "Bahia, Paraguay." The type collection was by Salzmann in Bahia. Duplicates are in several herbaria.

Panicum amphibolum Steud. Syn. Pl. Glum. **1**: 51. 1854. "*P. intermedium* Salzm. hrbr. Bahia."

Panicum intermedium Salzm.; Steud. Syn. Pl. Glum. **1**: 51. 1854, as synonym of *P. amphibolum*. Not *Panicum intermedium* Vahl, 1813. The type was collected in Bahia by Salzmann. A duplicate has been examined in the Trinius Herbarium.

Setaria biconvexa Griseb. Fl. Brit. W. Ind. 555. 1864. "Hab. Trinidad, *Cr.*, at S. Anne." The type, collected by Crueger, is in the Kew Herbarium, a fragment being in the National Herbarium.

Chaetochloa salzmanniana Hitchc. Contr. U. S. Nat. Herb. **17**: 265. 1913. Based on *Panicum sphaerocarpum* Salzm., not Ell. 1816.

Chaetochloa impressa Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 350. 1917. Based on *Panicum impressum* Nees.

Setaria sphaerocarpa Hubbard, Contr. Gray Herb. n. ser. **52**: 60. 1917. Based on *Panicum sphaerocarpum* Salzm.

This was described by Grisebach [1] as *Setaria onurus* and by Hitchcock and Chase [2] as *Chaetochloa onurus*, but a reconsideration of the type leads to the conclusion that the original *Panicum onurus* Willd. from Montevideo (as described by Trinius) [3] is a different species, later described as *Setaria caespitosa* Hack. & Arech.[4] *Panicum onurus* was earlier mentioned as a synonym by Nees (see note under *Chaetochloa macrostachya*). The first valid publication of the name, however, was by Trinius (loc. cit.), his type collected at Montevideo by Sello.

DESCRIPTION.

Plants perennial; culms glabrous, scabrous below the panicle, 1 to 1.5 meters tall, often geniculate at base; sheaths glabrous or usually scabrous toward the summit, villous on the margin, densely hispid on the collar; ligule densely pilose, 2 to 3 mm. long; blades flat, more or less scabrous, narrowed at base, acuminate at apex, as much as 35 cm. long and 2 cm. wide; panicles rather densely flowered, narrowed toward summit but not attenuate, somewhat interrupted or lobed below, 15 to 30 cm. long, 2 to 3 cm. wide, the branches ascending, the lower about 2 cm. long, the axis villous with hairs 1 to 2 mm. long; bristles 1 or 2 below each spikelet, 1 to 2 cm. long, flexuous, retrorsely scabrous and often also antrorsely toward the base, sometimes barblets directed both ways intermixed, pale or tawny, becoming implicate and somewhat one-sided with age; spikelets subspheric, about 2 mm. long, very turgid on one side and somewhat convex on the other; first glume about 1 mm. long or a little less, 5-nerved; second glume about two-thirds as long as the spikelet but at maturity pushed aside, exposing nearly half the fertile lemma, 7 to 9-nerved; sterile lemma as long as the fertile, 5 to 7-nerved, the nerves less distinct than those of the glumes, the palea well developed; fertile lemma very turgid, yellowish brown at maturity, rather indistinctly cross-wrinkled, the palea convex.

FIG. 42.—*Chaetochloa tenax*. From *Tracy* 9090, Cuba.

This species resembles *C. vulpiseta*, but is less robust and has retrorsely scabrous bristles and subspheric spikelets.

Hitchcock's no. 9926, from Puerto Colombia, has pubescent sheaths and blades.

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[1] Fl. Brit. W. Ind. 555. 1864.

[2] Contr. U. S. Nat. Herb. **18**: 349. 1917.

[3] Mém. Acad. St. Pétersb. VI. Sci. Nat. **1** : 226. 1834. See also Nees, Agrost. Bras. 251. 1829.

[4] Anal. Mus. Nac. Montevideo **1**: 166. 1894.

DISTRIBUTION.

Brushy slopes, southern Mexico and West Indies to Brazil.

VERACRUZ: Córdoba, *Hitchcock* 6424.

PANAMA: Taboga Island, *Hitchcock* 8085; *Celestine* 87.

CUBA: Sancti Spiritus, *Léon* 828. Matanzas, *Rugel* 880. Madruga, *Léon* 3456. Campo Florido, *Léon* 4145, Manatí, *Léon* 5684. Zaza del Sur, *Sergius* 2712. Triscornia, *Tracy* 9090. Woodfred, *Shafer* 3020. Bahia Honda, *Wilson* 9411. Guanavaca, *Wright* 3474. Without locality, *Wright* 3887.

JAMAICA: Two-mile Wood Pen, *Harris* 12065. New Forest, *Amer. Gr. Nat. Herb.* 608. Lititz, *Harris* 11657. Yardley Chase, *Harris* 9673.

WINDWARD ISLANDS: Barbados, *Dash* 603.

TRINIDAD: St. Joseph, *Hitchcock* 10180. Port of Spain, *Hitchcock* 9991; *Amer. Gr. Nat. Herb.* 609.

COLOMBIA: Santa Marta, *Smith* 2499. Puerto Colombia, *Hitchcock* 9926.

BRITISH GUIANA: Without locality, *Schomburgk* 414.

DUTCH GUIANA: Zandery, *Samuels* in 1916.

BRAZIL: Bahia, *Salzmann*.

PARAGUAY: Central Paraguay, *Morong* 658.

8. **Chaetochloa verticillata** (L.) Scribn.

Panicum verticillatum L. Sp. Pl. ed. 2. **1**: 82. 1762. "Habitat in Europa australi & Oriente."

Pennisetum verticillatum R. Br.; Roem. & Schult. Syst. Veg. **2**: 488. 1817, as synonym of *Setaria verticillata*. Brown says [1] in a note, "Huc [*Pennisetum*] pertinent *Panicum viride, verticillatum, helvolum*," but he does not make the combination.

Setaria verticillata Beauv. Ess. Agrost. 51, 178. 1812. Based on *Panicum verticillatum* L.

Setaria pseudoverticillata Fourn. Mex. Pl. **2**: 43. 1886. "San Luis de Potosi (VIRL. n. 1335 bis in herb. Mus. Paris)." This specimen has not been examined. The description appears to apply to *Chaetochloa verticillata*.

Chamaeraphis italica var. *verticillata* Kuntze, Rev. Gen. Pl. **2**: 768. 1891. Based on *Panicum verticillatum* L.

Chamaeraphis verticillata Porter, Bull. Torrey Club **20**: 196. 1893. Based on *Panicum verticillatum* L.

Ixophorus verticillatus Nash, Bull Torrey Club **22**: 422. 1895. Based on *Panicum verticillatum* L.

Chaetochloa verticillata Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897. Based on *Panicum verticillatum* L.

Several other synonyms are given in European works.

Schinz and Thellung [2] have applied the name *Setaria panicea*, based on *Cynosurus paniceus* L. Sp. Pl. 73. 1753, to this species. The description given by Linnaeus is as follows:

8. CYNOSURUS panicula subspicata, flosculis simplicibus biaristatis. *paniceus*
Panicum floribus conglomerato-spicatis laevibus arista dimidio brevioribus. *Fl. suec.* 54.
Panicum spica composita, aristis spica longioribus. *Virid. cliff.* 7. *Roy. lugdb.* 55.
Panicum spiculis spicatis scabritie adhaerentibus. *Hor. cl.* 27.
Gramen paniceum, spica aspera. *Bauh. pin.* 8. *Scheuch. gram.* 47.
Habitat in Europae *agris cultis*. [Sign for annual.]

[1] Prodr. Fl. Nov. Holl. **1**: 195. 1810.

[2] Vierteljahrs. Naturf. Ges. Zurich **53**: 519. 1908.

European botanists generally refer this to *Polypogon monspeliensis* (L.) Desf.[1] The synonym from the Flora Suecica refers to *Panicum viride* as stated by Schinz aud Thellung and as is determined by the common name (Hund-hirs) given in the Flora Suecica.[2] Schinz and Thellung look upon *Cynosurus paniceus* as a composite species consisting of two elements of which Linnaeus himself separated one as *P. viride*[3] in 1759, and the other as *P. verticillatum*[4] in 1762. Following the International Code, which requires that the original name be retained for one of the elements of a composite species, the authors hold that the name must apply to the residue after *P. viride* had been segregated. They therefore replace *Setaria verticillata* by *Setaria panicea* (L.) Schinz & Thell.

The present author rejects this disposition of the name because Linnaeus's own description given at the beginning of the paragraph above quoted from the Species Plantarum, does not apply to either *Panicum viride* or *P. verticillatum*, the phrase "flosculis simplicibus biaristatus" appearing to apply to *Polypogon monspeliensis*. This version is strengthened by the fact that Linnaeus later[5] transfers the name to *Alopecurus* and alters the description to read "Alopecurus panicula subspicata glumis villosis, corollis aristatus." Hence the name is to be referred as a synonym to *Polypogon monspeliensis*, based upon *Alopecurus monspeliensis* L.[6] There is no specimen in the Linnaean Herbarium to support *Cynosurus* (or *Alopecurus*) *paniceus*.

The plants described under *Chaetochloa brevispica* Scribn. & Merr.[7] are *C. verticillata*. The name is based on *Panicum verticillatum parviflorum* Doell[8] (not *Cenchrus parviflorus* Poir.) from Brazil. The type of this has not been examined.

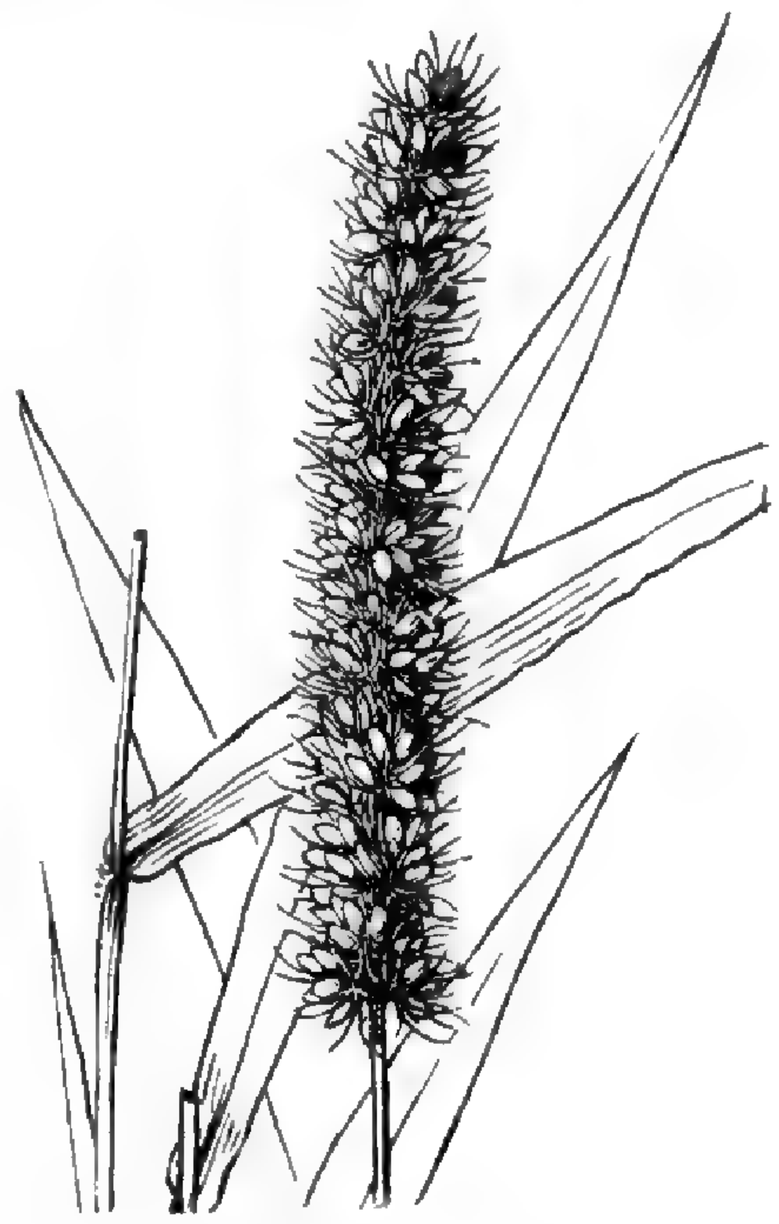

FIG. 43.—*Chaetochloa verticillata*. From *Steele* in 1898, District of Columbia.

DESCRIPTION.

Plants annual, often much branched at base and geniculate-spreading; culms smooth, scabrous below the panicle, as much as 1 meter tall, usually less; sheaths glabrous, or rarely scabrous toward the summit, ciliate, keeled; ligule very short, densely ciliate; blades flat, rather thin, scabrous on both surfaces, often more or less pilose on one or both surfaces with short scattered hairs, usually 10 to 20 cm. long and 5 to 10 mm. wide; panicles erect but not stiff, cylindric or somewhat tapering upward, more or less lobate or interrupted, especially toward base, mostly 5 to 15 cm. long, 7 to 15 mm. wide, or in robust specimens as much as 2 cm., the axis scabrous

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[1] Richt. Pl. Europ. **1**: 40. 1890; Aschers. & Graebn. Syn. Mitteleur. Fl. **2**: 161. 1899. (*Alopecurus paniceus*).

[2] Hartm. Handb. Skand. Fl. ed. 10. **1**: 275. 1870. *Cynosurus paniceus* is given as a synonym of *Setaria viridis*. Nathorst. Svenska Växtnamn. Ark. Bot. **2**[1]: 79. 1904. Hundhirs is given as a common name of *Setaria viridis*.

[3] Syst. Nat. ed. 10. **2**: 870. 1759.

[4] Sp. Pl. ed. 2. **1**: 82. 1762.

[5] Sp. Pl. ed. 2. **1**: 90. 1762.

[6] L. Sp. Pl. 61. 1753.

[7] U. S. Dept. Agr. Div. Agrost. Bull. **21**: 15. *f.* 5. 1900.

[8] In Mart. Fl. Bras. **2**[2]: 172. 1877.

or scabrous-hispid on the angles, more or less retrorsely so; branches closely many-flowered, scabrous-hispid on the angles like the axis, the cluster oblong, 3 to 10 mm. long, the branchlets very short, bearing 1 to 4 spikelets, a bristle below each spikelet; bristles 1 to 3 times as long as the spikelets, somewhat flexuous, retrorsely scabrous to base, this often flattened; spikelets about 2 mm. long, oblong-elliptic, not very turgid on the convex side; first glume about one-third as long as the spikelet, 3-nerved; second glume and sterile lemma as long as the spikelet, 5-nerved, the sterile palea usually partially developed; fertile lemma finely cross-wrinkled.

DISTRIBUTION.

A weed in cultivated soil and waste places, here and there throughout the United States, especially in the eastern states, south to Guatemala and Cuba. Introduced from Europe; said by Stapf [1] to be native in "Africa and India to Malaya, elsewhere (Europe, Australia, America) only as a weed."

ONTARIO: Galt, *Herriot* in 1908.
MASSACHUSETTS: Boston, *Boott* in 1861; *Morong* in 1877. Salem, *Conant* in 1879.
CONNECTICUT: Hartford, *Bissell* in 1903.
NEW JERSEY: Woodport, *Fisher* in 1898. Camden, *Scribner* 117; *Martindale* in 1877.
PENNSYLVANIA: Philadelphia, *Burk*. Harrisburg, *Hitchcock* in 1902. Easton, *Porter* in 1895.
INDIANA: Bluffton, *Williamson* 20841. Lafayette, *Dorner* 75.
ILLINOIS: Oquawka, *Patterson* in 1874. Wady Petra, *V. H. Chase* 77.
MICHIGAN: Saugatuck, *Umbach* in 1898.
WISCONSIN: Oshkosh, *Random* in 1896.
SOUTH DAKOTA: Vermillion, *Over* 5093.
IOWA: Mount Pleasant, *Mills* 773. Mount Ayr, *Beard* 929. Iowa City, *Hitchcock* in 1887; *Somes* 3699.
MISSOURI: St. Louis, *Eggert* 267. Independence, *Bush* 776.
DELAWARE: Wilmington, *Commons* 145 in 1897.
DISTRICT OF COLUMBIA: *Ward* in 1882; *Steele* in 1898; *Merrill* 177; *Vasey* in 1878.
ALABAMA: Mobile, *Mohr* in 1891.
UTAH: Salt Lake City, *Hitchcock* in 1901.
NEW MEXICO: Mesilla Valley, *Wooton & Standley* in 1907.
CALIFORNIA: Upland, *Johnston* 1639.
COAHUILA: Saltillo, *Hitchcock* 5640. Parrás, *Palmer* 453 in 1898.
JALISCO: Tequila, *Palmer* 404 in 1886. Guadalajara, *Palmer* 484 in 1886.
GUANAJUATO: Irapuato, *Hitchcock* 7438.
QUERÉTARO: Querétaro, *Hitchcock* 5806, 5807; *Arsène* 10279, 10381; *Basile* 49, 50.
PUEBLA: Tehuacán, *Hitchcock* 6054, 6064, 6084½.
OAXACA: Oaxaca, *Pringle* 4920; *Hitchcock* 6118.
GUATEMALA: Antigua, *Kellerman* 4814. Ciudad Vieja, *Tejada* 311.
BERMUDA: *Collins* 161; *Brown & Britton* 116, 302; *Harshberger* in 1905; *Millspaugh* 99, 127.
CUBA: Habana, *Curtiss* 693; *Hitchcock* 491; *Léon* 555; *Liebmann* 348. Bejucal, *Liebmann* 347. Guanabatano, *Liebmann* 346.

9. Chaetochloa scandens (Schrad.) Scribn.

Setaria scandens Schrad.; Schult. Mant. **2**: 279. 1824. The locality is not indicated. In the Trinius Herbarium is a specimen of "*Setaria scandens* Schrad. H. Gotting.," which is probably a part of the type material. "*Penniset. scandens* Jacq. fil. Cat. Sem. Hort. Vind. 1801" is cited as a synonym. This reference to a seed catalogue of the Vienna Garden has not been verified. The name there is doubtless a nomen nudum.

[1] In Thiselt.-Dyer, Fl. Cap. **7**: 430. 1899.

Panicum scandens Trin. Gram. Pan. 166. 1826. Based on *Setaria scandens* Schrad.

Panicum trinii Kunth, Enum. Pl. **1**: 151. 1833. Based on *Panicum scandens* Trin.

Panicum scandens α *vulgare* Doell in Mart. Fl. Bras. **2**^{2}: 171. 1877. Based on *Panicum scandens* Trin.

Panicum scandens γ *longisetum* Doell in Mart. Fl. Bras. **2**^{2}: 171. 1877. One of the four collections cited, *Burchell* 4510, from São Paulo, is in the National Herbarium.

Chaetochloa scandens Scribn. in Donn. Smith, Enum. Pl. Guat. **5**: 91. 1899. Based on *Setaria scandens* Schrad.

DESCRIPTION.

Plants annual, much branched below, erect or soon geniculate-spreading; culms slender, sometimes rooting at the lower nodes, as much as 80 cm. long, glabrous, sometimes appressed-pilose at the nodes, especially below the margin of the sheath; sheaths glabrous or sparsely appressed-pilose, or the lowermost densely pilose, the margin and collar densely pilose; ligule densely ciliate, less than 1 mm. long; blades flat, linear-lanceolate, as much as 10 cm. long and 1 cm. wide, scabrous, especially on upper surface, usually sparsely, sometimes densely pilose on both surfaces; panicles slender, erect, cylindric, densely flowered, some times slightly lobate or interrupted especially at base, often purplish, as much as 8 cm. long, mostly less than 5 mm. thick, the axis softly pubescent and also long-villous, the scattered hairs often longer than the spikelets; branches very short, pubescent and sparsely villous like the axis; clusters of bristles nearly sessile, divided into 3 to 5 short branchlets, each supporting a spikelet and 1 to 3 bristles; bristles somewhat flexuous but not becoming implicate, 1 to 2 times as long as the spikelets, antrorsely scabrous except near the tip, there more or less retrorsely scabrous; spikelets about 1.5 mm. long, ovoid, turgid on the convex side; first glume about half as long as the spikelet, very broad, enveloping the base of the spikelet, 3-nerved; second glume nearly as long as the spikelet, 5-nerved; sterile lemma as long as the spikelet or slightly exceeding the fertile lemma, 5-nerved, partly enveloping the fertile lemma, the first pair of nerves at the edges of the spikelet, the outer pair on the convex side of the spikelet; fertile lemma transversely striate or weakly rugose.

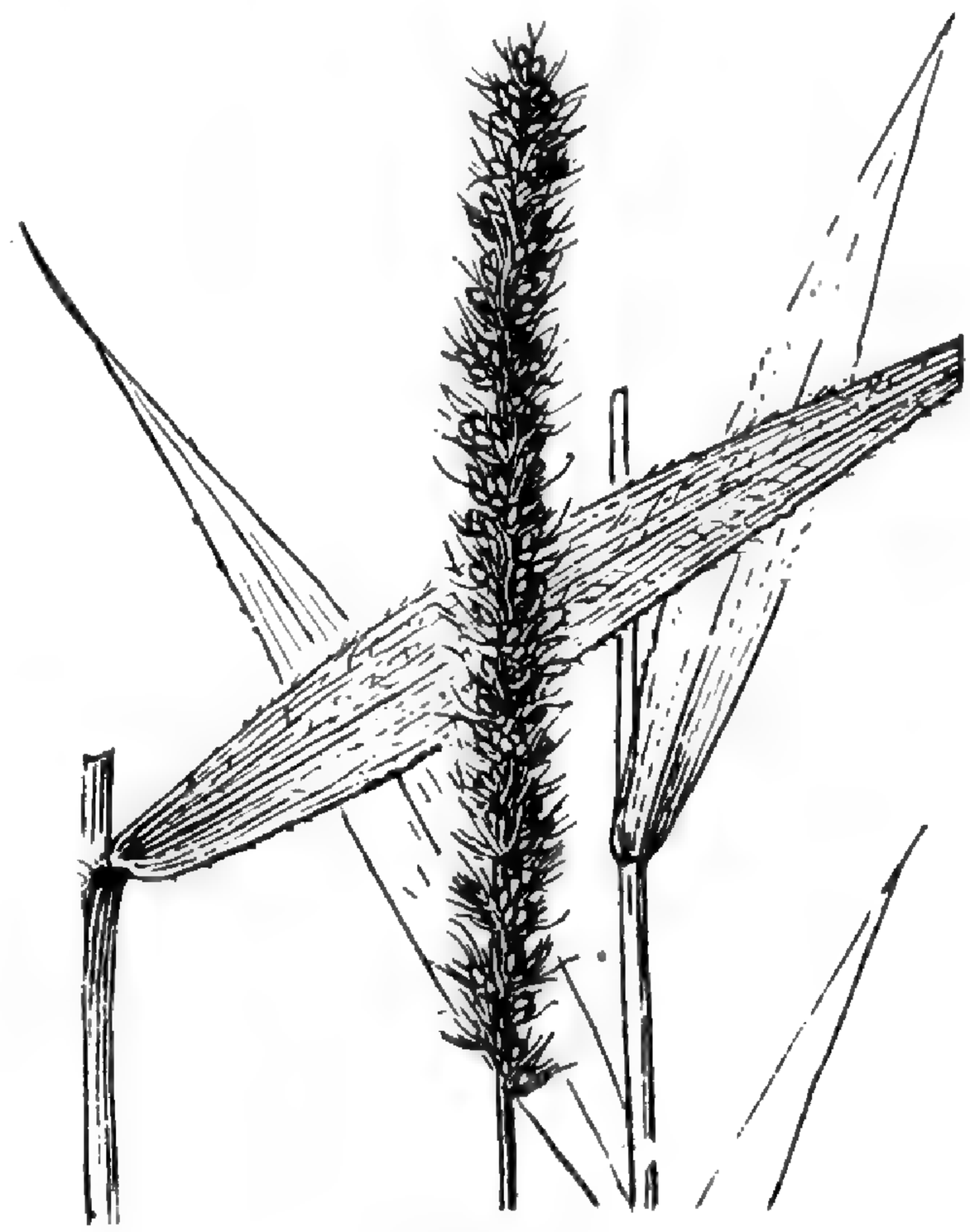

FIG. 44.—*Chaetochloa scandens*. From *Hitchcock* 9723, Jamaica.

DISTRIBUTION.

Open ground, Guatemala to Paraguay; also Jamaica and Haiti. Often a weed in cultivated soil.

GUATEMALA: Finca Tres Aguas, *Goll* 80.

COSTA RICA: San José, *Tonduz* 765. San Juan, *Tonduz* 1755.

PANAMA: Alhajuela, *Pittier* 3463.

JAMAICA: Gordon Town, *Hart* 796, 1487. Kellits, *Harris* 11157. Mount Hybla, *Harris* 11380. Malvern, *Harris* 9739. Troy, *Hitchcock* 9812. Ewarton, *Hitchcock* 9408. Cinchona, *Hitchcock* 9718, 9723.
HAITI: Port au Prince, *Cook, Scofield & Doyle* 62, 67. Marmelade, *Nash* 693.
COLOMBIA: La Trinidad, Libano, *Pennell* 3359 (N. Y. Bot. Gard. Herb.).
BRAZIL: Goyaz, *Gardner* 3515. Campinas, *Campos Novaes* 1240. Province Minas Geraes, *Widgren* 900. Rio de Janeiro, *Mertens*. Santarem, *Spruce*. Amazonas, *Capanema* 5441½. Without locality, *Burchell* 4356–2, 4510; *Riedel* (N. Y. Bot. Gard. Herb., ex Herb. Hort. Petrop., det. Trinius).
PARAGUAY: Sierra de Amambay, *Rojas* 10141. River Apa, *Hassler* 11901.

10. **Chaetochloa tenacissima** (Schrad.) Hitchc. & Chase.

Setaria tenacissima Schrad.; Schult. Mant. **2:** 279. 1824. "In Brasilia." The type has not been examined.

Panicum tenacissimum Nees, Agrost. Bras. 238. 1829. Based on *Setaria tenacissima* Schrad.

Chaetochloa tenacissima Hitchc. & Chase, Contr. U. S. Nat. Herb. **18:** 352. 1917. Based on *Setaria tenacissima* Schrad.

This was included with *Chaetochloa scandens* by Scribner and Merrill.[1] Schrader's descriptions of the two species are much alike, but the blades of *S. scandens* are described as subpilose, and those of *S. tenacissima* as scabrous. The bristles of *S. scandens* are said to be twice as long as the spikelets, and those of *S. tenacissima* much longer. These differences agree with the characters of the species as here segregated.

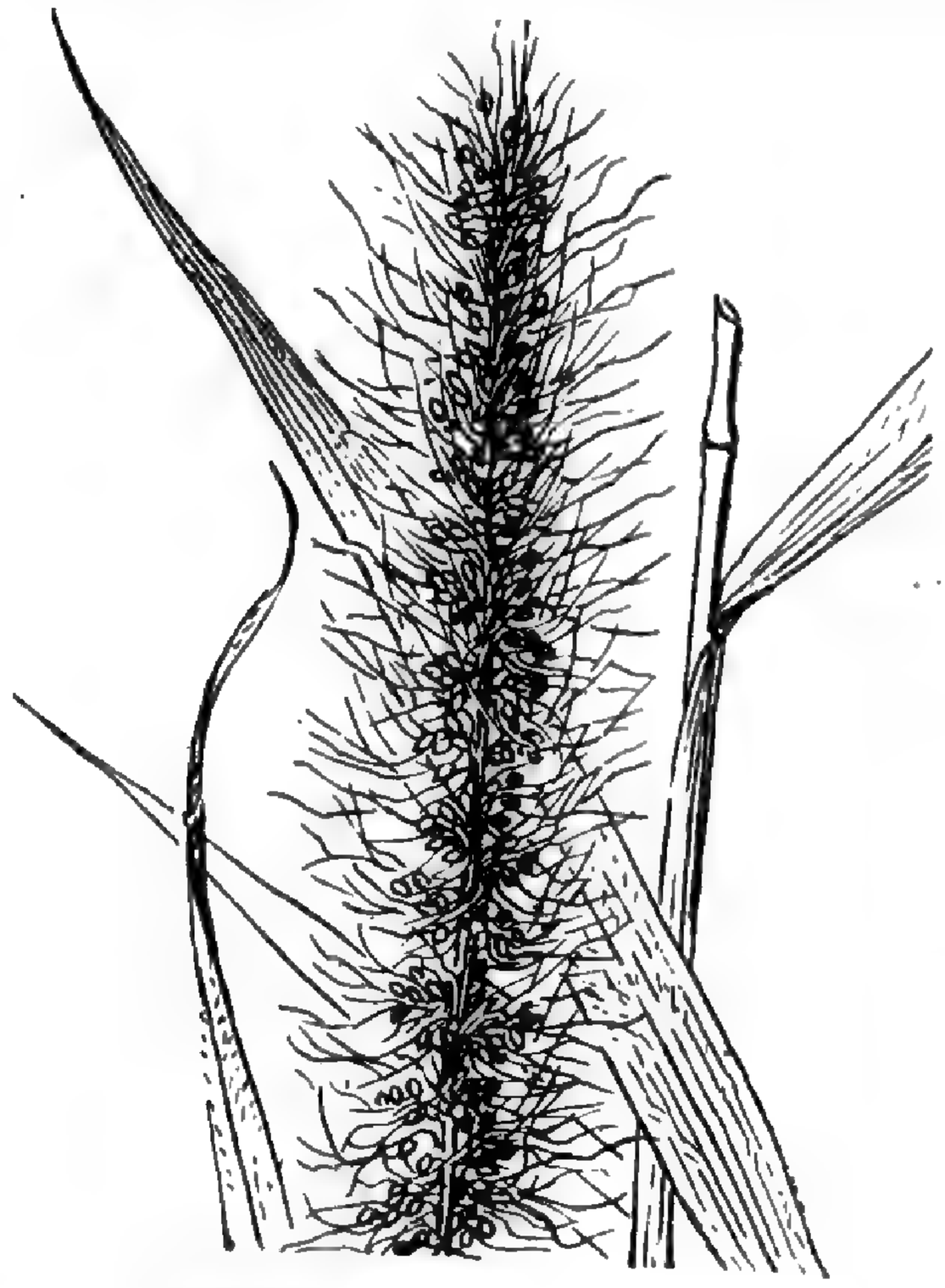

FIG. 45.—*Chaetochloa tenacissima*. From *Amer. Gr. Nat. Herb.* 610, Trinidad.

DESCRIPTION.

Plants annual, mostly simple or little branched; culms erect, slender, glabrous, scabrous below the panicle, 1 to 2 meters tall, leaning on or clambering over other vegetation; sheaths glabrous, antrorsely scabrous toward the summit, short-hispid on the margin and sparsely so on the surface above, more or less hispid on the collar; ligule very short, densely ciliate; blades flat, very scabrous on both surfaces and more or less pubescent especially beneath, mostly 10 to 15 cm., sometimes as much as 20 cm. long, mostly not over 8 mm. wide, gradually tapering from about the middle to the long-acuminate apex, rather abruptly narrowed at base; panicles somewhat nodding or flexuous, rather densely flowered above, somewhat interrupted toward the base, a little tapering toward the summit, as much as 15 cm. long and 1 cm. thick (excluding bristles), the axis densely pubescent and sparsely villous with long weak hairs; clusters of branchlets rather loose, 3 to 5 mm. long, dividing 2 or 3 times,

[1] U. S. Dept. Agr. Div. Agrost. Bull. **21:** 17. 1900.

each ultimate branchlet or pedicel bearing a bristle, the corresponding spikelet sometimes suppressed, the cluster bearing, therefore, usually not more than 8 spikelets and 8 bristles, the branchlet pubescent but not villous; bristle flexuous, becoming implicate, about 1 cm. long, scabrous, antrorsely below, retrorsely above; spikelets about 1.5 mm. long, often dark purple; first glume about half as long as the spikelet, 3-nerved; second glume and sterile lemma about as long as the fertile lemma, 5-nerved, the sterile palea wanting; fertile lemma transversely rugose with numerous fine ridges.

On account of the retrorsely scabrous bristles, the panicles of this species readily become attached to the clothing.

DISTRIBUTION.

Brushy hillsides, Guatemala to Brazil; also in Porto Rico.
Guatemala: Buena Vista, *Heyde & Lux* 4295.
Honduras: San Pedro Sula, *Thieme* 842, 5582 B.
Costa Rica: San José, *Tonduz* 3122. Cañas Gordas, *Pittier* 7346, 11006.
Panama: El Boquete, *Hitchcock* 8291.
Porto Rico: Utuado, *Sintenis* 6498.
Trinidad: Port of Spain, *Amer. Gr. Nat. Herb.* 610.
Venezuela: Tovar, *Fendler* 1644.
Brazil: Without locality, *Glaziou* 22614.

11. Chaetochloa grisebachii (Fourn.) Scribn.

Setaria grisebachii Fourn. Mex. Pl. **2**: 45. 1886. Fournier cites as synonym, "*S. setosa* Beauv. var. *caudata* Griseb. in sched." Grisebach's idea of *S. setosa* var. *caudata* is based on a specimen collected in Antigua by Wullschlaegel (no. 629). This name, published in the Flora of the British West Indian Islands,[1] is based on *Panicum caudatum* Lam., but Fournier's conception of Grisebach's idea is evidently based on two specimens in the Grisebach Herbarium which he considers to be conspecific, the one, *Wullschlaegel* 629, collected in Antigua and labeled by Grisebach with the varietal name and cited under the variety, the other *Schaffner* 36, collected at Orizaba and labeled by Grisebach "*Setaria setosa*." This second specimen, one of several cited by Fournier, is taken as the type of *S. grisebachii*.

Setaria laevis Fourn. Mex. Pl. **2**: 45. 1886. "Bernal (Karw. n. 961)." The type collection has been examined at the herbarium of the Botanical Garden at Petrograd.

Chaetochloa grisebachii Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897. Based on *Setaria grisebachii* Fourn.

Chaetochloa grisebachii ampla Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 36. *f. 21*. 1900. The range is given as "New Mexico; Mexico." No type is designated, but in the National Herbarium is the specimen from which the figure was drawn. This is *Pringle* 6470, from Federal District, Mexico. It is marked "Type" in Merrill's hand.

Chaetochloa grisebachii mexicana Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 37. 1900. "*Setaria mexicana* Schaffner in Herb." The two specimens cited are "San Luis Potosi, 1044 *Schaffner*, 1876; *Schaffner*, Sept., 1877." The type is in the Gray Herbarium. A duplicate type has been examined in the herbarium of the New York Botanical Garden. It bears two numbers, 193 and 1044. There are three plants, all depauperate, with narrow few-flowered panicles mostly not exceeding the leaves. One plant has two larger panicles. This form appears to differ only in being depauperate.

Setaria mexicana Schaffn.; Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 37. 1900, as synonym.

[1] 555. 1864.

DESCRIPTION.

Plants annual, branched at base, erect or spreading; culms as much as 1 meter tall but usually less, smooth, or scaberulous below the pubescent nodes and below the panicle; sheaths smooth, scabrous, or sparingly hispidulous, often papillose, densely-ciliate, pubescent or hispid on the collar; ligule a short, densely ciliate membrane scarcely 1 mm. long, blades flat, mostly rather lax, erect or ascending, straight, puberulent, and scabrous, as much as 25 cm. long and 1.5 cm. wide, usually less than 15 cm. long and 1 cm. wide; panicle loosely flowered, narrow, tapering toward apex, mostly less than 15 cm. long, the axis scabrous and, except the lower part, also villous; branches rather densely flowered, the lower somewhat distant, sometimes as much as 2 or 2.5 cm. long, spreading, usually 5 to 10 mm. long, and, except the lower, approximate; ultimate branchlets about 0.5 mm. long, bearing a single spikelet and a single bristle below, the spikelet sometimes rudimentary, thus bringing the bristles in pairs; bristles 5 to 15 mm. long, sometimes shorter, flexuous, antrorsely scabrous, green or purplish; spikelets about 2 mm. long, moderately turgid on the convex side; first glume one-fourth to one-third the length of the spikelet, 3-nerved; second glume a little shorter than the spikelet, 5-nerved; sterile lemma as long as the fertile lemma, 5-nerved, the palea small; fertile lemma acute, finely cross-wrinkled.

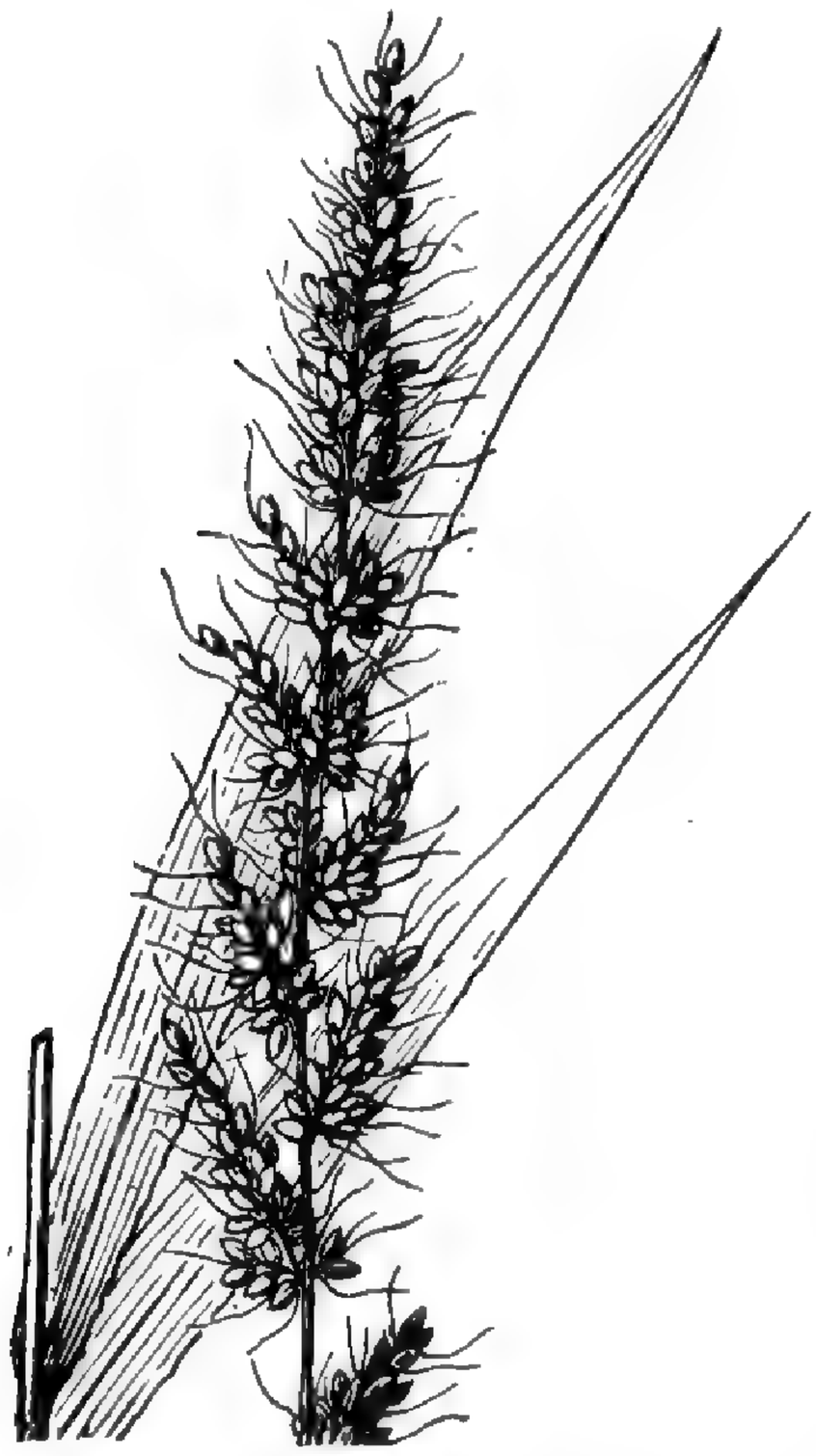

FIG. 46.—*Chaetochloa grisebachii*. From *Metcalfe* 1262, New Mexico.

DISTRIBUTION.

Open ground, often a weed in fields, Texas to Arizona, south to Oaxaca.

TEXAS: Kerrville, *Heller* 1897. Limpia Canyon, *Nealley* 130. Austin, *Hall* 841. New Braunfels, *Biltmore Herb.* 14922.

NEW MEXICO: Organ Mountains, *Hitchcock* 3786; *Wooton & Standley* in 1906. Mangas, *Smith* in 1897. Queen, *Hitchcock* 13520. Hillsboro, *Metcalfe* 1262. Without locality, *Wright* 2096.

ARIZONA: Santa Rita Mountains, *Griffiths & Thornber* 141, 266; *Griffiths* 3428, 6075; *Wooton* in 1914. Beaver Creek, *MacDougal* 606. Bowie, *Jones* 4288. Southern Arizona, *Rothrock* 676. Gardiners Spring, *Pringle* in 1882. Tucson, *Hitchcock* 3514. Patagonia, *Hitchcock* 3662, 3679, 3681. Paradise, *Blumer* 1660, 1724. Sulphur Spring Valley, *Griffiths* 1901. Bisbee, *Goodding* 983. Clear Creek, *Toumey* 78 in 1891. San Bernardino Ranch, *Mearns* 2000.

CHIHUAHUA: Chihuahua, *Hitchcock* 7774; *Pringle* 381. Sierra Madre, *Nelson* 6299.

COAHUILA: San Lorenzo Canyon, *Palmer* 397 in 1904. Saltillo, *Palmer* 385 in 1898; *Hitchcock* 5626, 5641. Chojo Grande, *Palmer* 336 and 337 in 1904.

SAN LUIS POTOSÍ: San Luis Potosí, *Parry & Palmer* 957.

DURANGO: Torreón: *Hitchcock* 7546. Durango, *Hitchcock* 7573; *Palmer* 716 and 728 in 1896.

JALISCO: Guadalajara, *Hitchcock* 7338, 7369.

AGUASCALIENTES: Aguascalientes, *Hitchcock* 7461.

GUANAJUATO: Irapuato, *Hitchcock* 7427.
QUERÉTARO: Querétaro, *Arsène* 10275, 10346; *Basile* 47, 48.
VERACRUZ: Orizaba, *Schaffner* 36.
PUEBLA: Tehuacán, *Liebmann* 361; *Hitchcock* 6095. Puebla, *Nicolas* 314 and in 1909. San Marcos, *Hitchcock* 6512. Atlixco, *Nelson* in 1893.
MEXICO: Río Hondo, *Pringle* 7533; *Holway* 11, 3153.
FEDERAL DISTRICT: *Pringle* 6470, 9578, 9579; *Orcutt* 3697, 4342; *Holway* 3040, 3554; *Hitchcock* 5911, 5925, 7836; *Bourgeau* 441.
MICHOACÁN: Punguato, *Arsène* in 1912. Morelia, *Arsène* in 1909.
OAXACA: El Parián, *Pringle* 4937. Oaxaca, *Hitchcock* 6178, 6184; *Smith* 939; *Conzatti & González* 344.

12. **Chaetochloa magna** (Griseb.) Scribn.

Setaria magna Griseb. Fl. Brit. W. Ind. 554. 1864. "Jamaica!, *Pd.* [Purdie], along the lagoons behind the ferry." In the Grisebach Herbarium are some fragments of the type, the original being probably at Kew.

Chamaeraphis magna Beal, Grasses N. Amer. **2**: 152. 1896. Based on *Setaria magna* Griseb.

Chaetochloa magna Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897. Based on *Setaria magna* Griseb.

Chaetochloa magna was included by Elliott[1] under *Panicum italicum*.

FIG. 47.—*Chaetochloa magna*. From *Nash* 1279, Florida.

DESCRIPTION.

Plants annual, robust, erect, usually not branched at base, sparingly branched above, the branches erect; culms as much as 4 meters tall, rarely taller, and 2 cm. thick at base, smooth, scabrous below the panicle; sheaths smooth or scabrous at summit, hispid-ciliate on the margins; ligule a densely and stiffly hispid membrane, 1 to 2 mm. long; blades flat, scabrous, as much as 0.5 meter long and 3.5 cm. wide; panicles densely flowered, nodding, often interrupted at base, tapering at each end, as much as 40 cm. long and 3 cm. thick, those of the branches much smaller, the axis densely pubescent and also villous with ascending hairs about 1 mm. long; branches as much as 1.5 cm. long, many-flowered; bristles somewhat flexuous, 1 or 2 below each spikelet, 1 to 2 cm. long; spikelets about 2 mm. long, not very turgid on the convex side; first glume about one-third as long as the spikelet, 3-nerved; second glume about as long as the spikelet, 5-nerved; sterile lemma as long as the spikelet, 7-nerved, the sterile palea well developed; fertile lemma smooth.

Nash's no. 1279, from Eustis, Florida, is noted by the collector as being 8 to 20 feet tall.

DISTRIBUTION.

Marshes and wet places along the coast, Delaware to Florida and Texas; also in the West Indies and Panama.

DELAWARE: Woodland Beach, *Commons* in 1892. Collins Beach, *Commons* in 1897
MARYLAND: Millstone, *Hitchcock* 7890; *Tidestrom* 5321.

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[1] Bot. S. C. & Ga. **1**: 113. 1816.

VIRGINIA: Virginia Beach, *Bradford* in 1900. Smiths Island, *Palmer* in 1897.
NORTH CAROLINA: Wilmington, *Hitchcock* in 1905.
SOUTH CAROLINA: Bluffton, *Mellichamp* in 1883.
GEORGIA: Experiment, *Redding* in 1895.
FLORIDA: Alachua, *Combs* 748. Grasmere, *Combs* 1054. Homosassa, *Combs* 964. Merritts Island, *Curtiss* 3618. Okeechobee region, *Fredholm* 6178. Palm Beach, *Curtiss* 5410. Eustis, *Nash* 1279. Clarcona, *Meislahn* 76. Manatee, *Rugel* 365. St. Vincent Island, *Pierce* in 1911; *McAtee* 1713A. Dania, *Eaton* 828. Apopka, *Baker* in 1897 and 1898. Bartow, *Combs* 1219. Deland, *Hill* in 1899.
ALABAMA: Mobile, *Mohr* in 1869.
LOUISIANA: Lake Charles, *Allison* 110. Pointe a la Hache, *Langlois* 56. Burton Island, *Tracy & Lloyd* 463. New Orleans, *Fisher* 133; *Biltmore Herb.* 3459a. Houma, *Wurzlow* in 1913.
TEXAS: Galveston, *Tracy* 7747. "Western Texas to El Paso," *Wright* 801. Eagle Lake, *Plank* in 1891.
COSTA RICA: Boca Zacate, *Pittier* 6825. Punta Mala, *Tonduz* 6825.
BERMUDA: *Munro* in 1864. (This locality is doubtful as the species is not known to grow in Bermuda now.)
JAMAICA: Black River, *Hitchcock* 9646. Ferry River, *Purdie* (in Grisebach Herb.).
PORTO RICO: Campo Alegre, *Chase* 6800. Without locality, *Eggers* 709.
LEEWARD ISLANDS: Guadeloupe, *Duss* 3918.

13. **Chaetochloa ambigua** (Guss.) Scribn. & Merr.

Panicum verticillatum β ambiguum Guss. Fl. Sic. Prodr. 80. 1827. Sicily.

Setaria ambigua Guss. Fl. Sic. Syn. **1:** 114. 1842. Based on *Panicum verticillatum β ambiguum* Guss.

Setaria verticillata var. *ambigua* Parl. Fl. Palerm. **1:** 36. 1845. Based on *Panicum verticillatum β ambiguum* Guss.

Panicum ambiguum Hausskn. Oesterr. Bot. Zeitschr. **25:** 345. 1875. Based on *Setaria ambigua* Guss.

Chamaeraphis italica var. *ambigua* Kuntze, Rev. Gen. Pl. **2:** 768. 1891. Based on "*Panicum ambiguum* Guss."

Chaetochloa ambigua Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21:** 18. *f.* 7. 1900. Based on *Setaria verticillata* var. *ambigua* Guss.

A complete synonymy is given by Hubbard.[1]

DESCRIPTION.

Plants with the aspect of *Chaetochloa verticillata*, differing in the longer ligule, scabrous but not pilose blades, and the antrorsely scabrous bristles. The bristles are mostly 2 to 3 times as long as the spikelets and at maturity are spreading and more or less implicate.

This may be only a variety of *Chaetochloa verticillata* or of *C. viridis*, between which it seems to be intermediate. It is retained as a species because it can not be definitely referred to either of the two species mentioned.

DISTRIBUTION.

Central and southern Europe; sparingly introduced in the United States.
PENNSYLVANIA: Ballast ground near Philadelphia, *Scribner* in 1884.
DISTRICT OF COLUMBIA: A weed in the grass garden, *Merrill*, Sept. 20, 1900; *Merrill* 175, July 30, 1900.
ALABAMA: Waste places, Mobile, *Mohr* in 1884.

[1] Amer. Journ. Bot. **2:** 179. 1915.

14. Chaetochloa viridis (L.) Scribn.

Panicum viride L. Syst. Nat. ed. 10. **2:** 870. 1759. No locality is given. A reference is made to "Spec. pl. n. 2. β." Panicum number 2 in the Species Plantarum is *P. glaucum.* No locality is given for variety β, but this is based on a citation from Scheuchzer,[1] describing a plant from Europe.

Setaria viridis Beauv. Ess. Agrost. 51, 178. 1812. *Panicum viride* is included as a species of Setaria, and *Setaria viridis* is given in the index.

Pennisetum viride R. Br.; Roem. & Schult. Syst. Veg. **2:** 489. 1817, as synonym of *Setaria viridis.*[2]

Setaria weinmanni Roem. & Schult. Syst. Veg. **2:** 490. 1817. Bohemia.

Panicum viride β *brevisetum* Doell, Rhein. Fl. 128. 1843. A form with bristles only a little longer than the spikelets.

Panicum italicum var. *viride* Koern. in Koern. & Wern. Handb. Getreid. **1:** 277. 1885. Based on *Panicum viride* L.

Chamaeraphis italica var. *viridis* Kuntze, Rev. Gen. Pl. **2:** 767. 1891. Based on *Panicum viride* L.

Chamaeraphis viridis Millsp. W. Va. Agr. Exp. Sta. Bull. [Fl. W. Va.] **2:** 466. 1892. Based on *Panicum viride* L.

Ixophorus viridis Nash, Bull. Torrey Club **22:** 423. 1895. Based on *Panicum viride* L.

Chaetochloa viridis Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4:** 39. 1897. Based on *Panicum viride* L.

Setaria viridis var. *weinmanni* Borbás, Math. Termesz. Közlem. **15:**310. 1878, an unverified citation; Brand in Koch, Syn. Deutsch. Schweiz. Fl. ed. 3. **3:** 2690. 1905. Based on *Setaria weinmanni* Roem. & Schult.

FIG. 48.—*Chaetochloa viridis.* From *Thompson* 129, Kansas.

Setaria viridis var. *breviseta* Hitchc. in A. Gray, Man. ed. 7. 119. 1908. Based on *Panicum viride* var. *brevisetum* Doell.

Several other synonyms are given in European botanies. Hubbard has given an extensive bibliography.[3]

DESCRIPTION.

Plants annual, usually branched at base, sometimes geniculate-spreading; culms smooth, scabrous below the panicle, usually 20 to 40 cm. tall, sometimes as much as 1 meter; sheaths smooth, or scabrous toward the summit, ciliate on the margin and sometimes a little on the collar; ligule very short, densely ciliate; blades flat, linear-lanceolate, straight (not twisted), scabrous especially on the upper surface, usually less than 15 cm. long, commonly less than 1 cm. wide, sometimes as much as 15 mm. wide; panicle erect or somewhat nodding, densely flowered, green or purple, cylindric but tapering a little at the summit (the smaller ones ovate), rarely as much as 10 cm. long, usually less than 7 cm., commonly 5 to 8 mm. thick (excluding bristles),

[1] Scheuchz. Agrost. Hist. 46. 1719.

[2] See note on *Pennisetum verticillatum*, p. 178.

[3] Amer. Journ. Bot. **2:** 175. 1915.

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the axis densely pubescent and also villous with numerous hairs about 1 mm. long; branches very short, bearing several (mostly 5 or 6) spikelets, the rachis pubescent; bristles 1 to 3 below each spikelet, mostly 3 to 4 times as long as the spikelet, antrorsely scabrous, greenish or rarely purplish; spikelets 2 to 2.5 mm. long, elliptic, not much turgid on the convex side; first glume one-third to one-fourth as long as the spikelet, 3-nerved; second glume and sterile lemma about as long as the spikelet or the former a little shorter, 5-nerved, the sterile palea not fully developed; fertile lemma finely transversely wrinkled or ridged.

Commonly known as green foxtail. In abnormal specimens the panicle may be forked or variously branched.

DISTRIBUTION.

A weed in cultivated soil and waste ground, common throughout the cooler parts of the United States; rare in Mexico; introduced from Europe; widely distributed in Asia and northern Africa.

NEWFOUNDLAND: *Waghorne* in 1892.

NEW BRUNSWICK: Shediac Cape, *Hubbard* 761, 762. Campbellton, *Fowler* in 1905.

QUEBEC: Montreal, *Mohr* in 1882. Rivière du Loup Falls, *Eggleston* 3145. Cap-à-L'Aigle, *Eggleston* 2996.

ONTARIO: Hen Island, *Morris* 79. Ottawa, *Rolland* 56; *Fletcher* in 1891. Toronto, *Biltmore Herb.* 3453a. Kingston, *Fowler* in 1895.

BRITISH COLUMBIA: Lillooet, *Macoun* 91571. Sicamous, *Macoun* 8.

MAINE: Bangor, *Knight* 21, 23. Augusta, *Scribner* in 1869. Boundary Lake, *Eggleston & Fernald* in 1902.

NEW HAMPSHIRE: Peterboro, *Robinson* 236. Shelburne, *Deane* in 1915.

VERMONT: Manchester, *Day* 207. Rutland, *Kirk* 1015.

MASSACHUSETTS: Medford, *Boott* in 1866. Marthas Vineyard, *Harrison* in 1888. Melrose, *Morong* in 1876.

CONNECTICUT: South Glastonbury, *Wilson* 1264.

NEW YORK: Oxford, *Coville* in 1884. North Hannibal, *Pearce* in 1883. Union Springs, *Dudley* 37.

NEW JERSEY: Weehawken, *Kearney* in 1894.

PENNSYLVANIA: Harrisburg, *Small* in 1888; *Hitchcock* in 1903. Lancaster, *Heller* 4817. Easton, *Porter* in 1887. Philadelphia, *Scribner* in 1878. Binkleys Ridge, *Heller* 4823.

OHIO: Kipton, *Ricksecker* in 1894. Columbus, *Kellerman* 6836.

INDIANA: Lafayette, *Dorner* 72. Lake Gage, *Deam* in 1903.

ILLINOIS: Naperville, *Umbach* in 1895. Glasford, *Wilcox* 162. Wady Petra, *V. H. Chase* 74. Chicago, *Chase* 1611. East Mount Carmel, *Schneck* in 1904. Urbana, *Gates* 1962.

MICHIGAN: Keweenaw County, *Farwell* 629. Marquette County, *Barlow* in 1901.

WISCONSIN: Oshkosh, *Random* in 1896. Newbold, *Cheney* 1701.

MINNESOTA: Camp Douglas, *Mearns* 63. Fort Snelling, *Mearns* 62. Root River Valley, *Mearns* 64. Duluth, *Hitchcock* 5089.

NORTH DAKOTA: Leeds, *Lunell* in 1904 and 1909. Fargo, *Wright* 934.

SOUTH DAKOTA: Jamesville, *Bruce* 12. Bellefourche, *Griffiths* 365. Minnekahta, *Rydberg* 1102. Redfield, *Griffiths* 208. Hot Springs, *Hitchcock* 11167. Aberdeen, *Griffiths* 123. Brookings, *Griffiths* in 1892.

IOWA: Ames, *Pammel, Amer. Weeds* 16. Des Moines, *Ball* 28. Manchester, *Ball* 1007. Clinton, *Ball* 267, 268. Battle Creek, *Preston* 956. Fayette County, *Fink* 273. Iowa City, *Somes* 3637.

NEBRASKA: Kearney, *Holms* in 1889. Forest Station, *Hitchcock* 11032, 11033. Mullen, *Rydberg* 1568. Central City, *Rydberg* 2009; *Shear* 262. Wiegand, *Clements* 2684.

MISSOURI: St. Louis, *Eggert* 268. Clarksville, *Davis* 1132, 1165, 1224, 1236. Courtney, *Bush* 1671. Springfield, *Standley* 8677.
KANSAS: Riley County, *Norton* 576. Tribune, *Reed* in 1892. Syracuse, *Thompson* 129.
DELAWARE: Stanton, *Commons* 147 in 1897.
MARYLAND: Great Falls, *Painter* 470. Garrett County, *Smith* in 1879.
DISTRICT OF COLUMBIA: *Hitchcock* 97; *Topping* in 1895; *Pollard* 532.
NORTH CAROLINA: Magnetic City, *Wetherby* 9.
FLORIDA: St. Vincent Island, *McAtee* 1720B.
TENNESSEE: Knoxville, *Scribner*.
ALABAMA: Mobile, *Mohr* in 1868. Tuskegee, *Carver* 15.
MISSISSIPPI: Ocean Springs, *Forkert* in 1898.
LOUISIANA: Alexandria, *Ball* 446.
TEXAS: Paloduro, *Gardner* 19. Kerrville, *Heller* 1889; *Hitchcock* 5263. Chillicothe, *Ball* 967. Big Spring, *Hitchcock* 13362.
OKLAHOMA: Cora, *Stevens* 762. Alva, *Stevens* 1606. Canton, *Stevens* 854. Tonkawa, *Stevens* 1898.
MONTANA: Selish, *Griffiths & Lange* 14. Bozeman, *Blankinship* in 1898. Columbia Falls, *Hitchcock* 4934.
WYOMING: Sundance, *Griffiths* 489. Sheridan, *Nelson* 305.
IDAHO: Coeur d'Alene, *Rust* 370. St. Anthony, *Merrill* 47, 51; *Merrill & Wilcox* 432. New Plymouth, *Macbride* 286. Moscow, *Henderson* 2849.
WASHINGTON: North Yakima, *Hunter* 593.
OREGON: Portland, *Suksdorf* 1713. Milton, *Brown* 33.
COLORADO: Fort Collins, *Cowen* 3381. Minnehaha (Pikes Peak), *Hitchcock* 2369. Colorado Springs, *Williams* 2158. Idaho Springs, *Shear* 746. Rocky Ford, *Griffiths* 3306. Glenwood Springs, *Shear & Bessey* 1304.
UTAH: Cainville, *Jones* 5696. Elk Ranch, *Jones* 6031. Gunnison, *Ward* 688. Ogden, *Hitchcock* 10888.
NEW MEXICO: South end of Black Range, *Metcalfe* 1139, 1499. Cloudcroft, *Hitchcock* 13297. Farmington, *Standley* 6935. Pecos, *Standley* 5017. White Mountains, *Wooton & Standley* 3579. Sabinal, *Wooton* 1079. Deming, *Hitchcock* 3754. Las Vegas Hot Springs, *Cockerell* 11. Cedar Hill, *Standley* 7933. Shiprock Agency, *Standley* 7236. Mesilla, *Wooton* 89.
ARIZONA: Verde Valley, *MacDougal* 532. Barfoot Park, *Blumer* 1588. Strawberry Creek, *MacDougal* 706. Tucson, *Griffiths* 1526. Tanner Canyon, *Goodding* 819. White Mountains, *Griffiths* 5375.
CALIFORNIA: Rialto, *Parish* 2112. Los Angeles, *Davidson* 3257. Stanford Campus, *Abrams* 7333.
SAN LUIS POTOSÍ: San Luis Potosí, *Hitchcock* 5664.
VERACRUZ: Córdoba, *Hitchcock* 6450.
MEXICO (Republic of): Without locality, *Liebmann* 349.
COSTA RICA: Cartago, *Pittier* 9037.
BERMUDA: *Collins* 159, 160.

15. **Chaetochloa italica** (L.) Scribn.

Panicum italicum L. Sp. Pl. 56. 1753. "Habitat in Indiis."

Panicum germanicum Mill. Gard. Dict. ed. 8. *Panicum* no. 1. 1768. No locality is given. Miller takes the specific name from Bauhin, whose phrase name he cites, "Panicum germanicum, sive panicula minore C. B. P. 27." [Caspar Bauhin, Pinax.] The type specimen, at the British Museum of Natural History, is the upper part of a culm with a panicle and two leaves. The panicle is 10 cm. long, 2 cm. wide, dense, the bristles not much exceeding the spikelets; the blades are 1.5 cm. wide.

Panicum italicum var. *germanicum* Koel. Descr. Gram. 17. 1802. Based indirectly on *Panicum germanicum* Mill. Bauhin's name (see above) is cited.

Pennisetum italicum R. Br. Prodr. Fl. Nov. Holl. **1**: 195. 1810. Based on *Panicum italicum* L.

Setaria italica. Beauv. Ess. Agrost. 51, 170, 178. 1812. Based on "*Panicum italicum* Willd." [*P. italicum* L.].

Setaria californica Kellogg, Proc. Calif. Acad. **1**: ed. 2. 26. 1873.[1] "From the head valley of the Sacramento River," California. Described as 10 to 12 feet high and "quite similar to *Setaria italica*." It was supposed to be native but the description points conclusively to *C. italica*.

Chamaeraphis italica Kuntze, Rev. Gen. Pl. **2**: 767. 1891. Based on *Panicum italicum* L.

Ixophorus italicus Nash, Bull. Torrey Club **22**: 423. 1895. Based on *Panicum italicum* L.

Chaetochloa italica Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897. Based on *Panicum italicum* L.

For complete synonymy see Hubbard's paper on *Setaria italica* and its allies.[2]

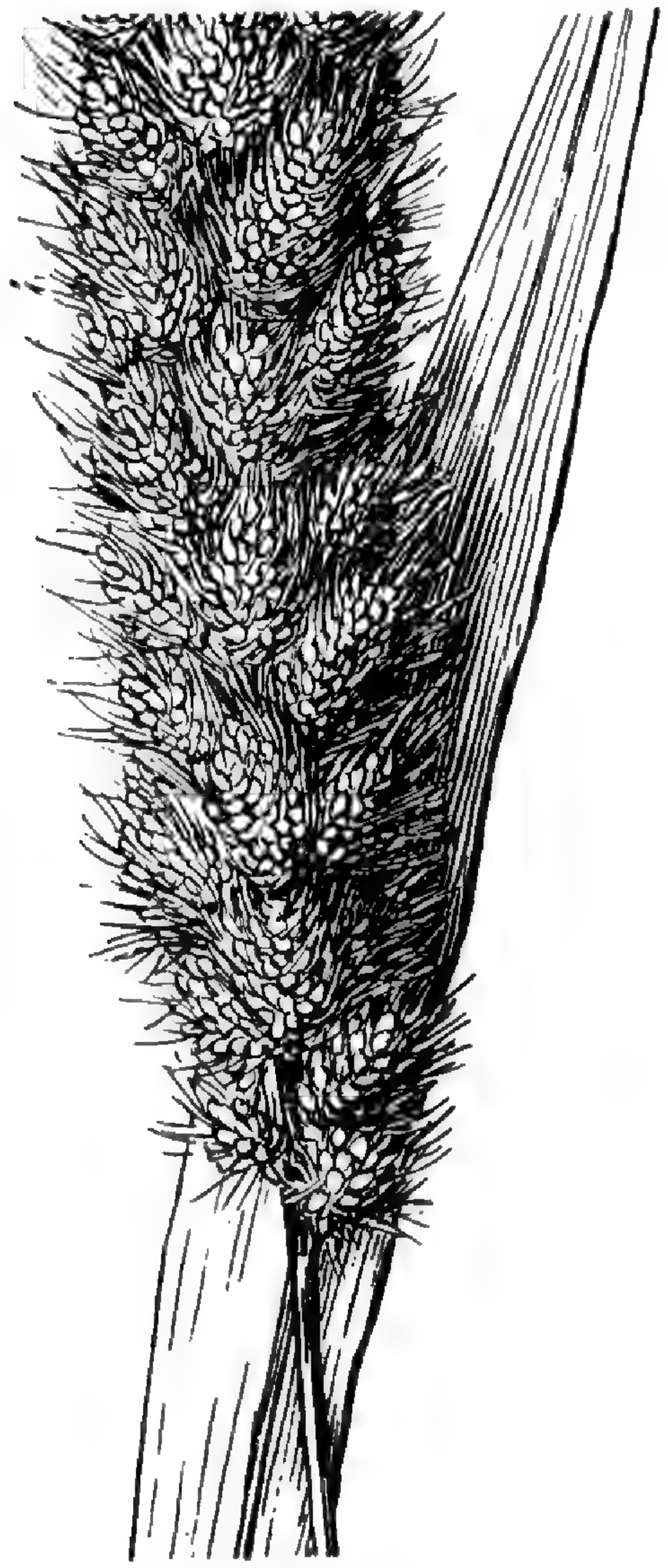

FIG. 49.—*Chaetochloa italica*. From *Williams* 82, District of Columbia.

DESCRIPTION.

A cultivated form of *C. viridis*, differing in being more robust, with broader blades, and larger lobate panicles, the fruit (fertile lemma and palea) at maturity falling away from the remainder of the spikelet.

Commonly known as millet, foxtail millet, and Hungarian grass. There are many varieties in cultivation, differing in the length and color of the bristles, the color of the fruit, and the size and degree of lobing of the panicle or head. The varieties are discussed by Koernicke[3] and by Hubbard.[4] The culm may be as much as 1 cm. thick, the blades as much as 3 cm. wide, and the heads as much as 30 cm. long. At maturity the fruit becomes very turgid and spreads apart the glumes and sterile lemma, and is distinctly longer than these. The head, in some forms, becomes heavy and nodding, and distinctly lobate. The color of the fruit varies from tawny to red, brown, and black. The bristles are 1 to 3 times as long as the spikelet, and green, purple, or brown. The fruit is smooth or obscurely cross-wrinkled and may be as much as 3 mm. long.

In the cultivated forms the rachilla disarticulates above the sterile lemma, so that the fruit at maturity readily falls from the spikelet and hence shells out when the heads are threshed. The plants propagate themselves in fields and waste places and then tend to revert to a more primitive form. These uncultivated plants are often difficult to distinguish from forms of *Chaetochloa viridis*. This is especially true in immature specimens, as the disarticulation of the fruit is evident only at maturity and even then, in the uncultivated plants, is often less marked.

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[1] The Proceedings were first published in a newspaper, "The Pacific," in 1854. Edition 2 is an exact reprint in book form.

[2] Amer. Journ. Bot. **2**: 169. 1915.

[3] Koern. & Wern. Handb. Getreid. **1**: 270–279. 1885.

[4] Amer. Journ. Bot. **2**: 169. 1915.

DISTRIBUTION.

Cultivated throughout the warmer parts of the Old World and in the United States, especially from Nebraska to Texas; escaped from cultivation, and appearing more or less as a waif in waste places throughout the United States.

16. **Chaetochloa longipila** (Fourn.) Scribn. & Merr.

Setaria longipila Fourn. Mex. Pl. **2**: 47. 1886. "Absque loco (JURG. n. 722)." The type has not been examined, but the description appears to apply to the specimen cited below (*Rose* 2017). Fournier mentions the long white hairs on the rachis, the length of the first glume, and the rugose fertile lemma.

Chaetochloa longipila Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 22. 1900. Based on *Setaria longipila* Fourn.

DESCRIPTION.

Plants annual; culms erect, branching at base, glabrous, scabrous just below the panicle, 30 to 40 cm. tall, the nodes hispidulous; sheaths mostly glabrous, sometimes scaberulous at summit or sparsely hispid, densely ciliate on the margin, hispid on the collar; ligule a dense line of stiff white hairs 2 to 3 mm. long; blades flat, 7 to 10 cm. long, as much as 1 cm. wide, scabrous and sometimes sparsely hispidulous, narrowed toward each end; panicle spikelike, cylindric, somewhat interrupted, rather densely flowered, narrowed toward the summit, 4 to 7 cm. long, about 5 mm. wide, the axis thickly beset with white, ascending, rather stiff flexuous hairs about 2 mm. long; branches short and ascending, the rachis somewhat villous like the main axis; bristles mostly one below each spikelet, mostly 3 to 5 cm. long, antrorsely scabrous; spikelets about 1.7 mm. long, turgid on the convex side; first glume about half as long as the spikelet, 3-nerved; second glume about as long as the fertile lemma or very slightly shorter, 5-nerved; somewhat pointed; sterile lemma as long as the fertile, 5-nerved, slightly pointed; fertile lemma sharply transversely rugose.

FIG. 50.—*Chaetochloa longipila*. From *Rose* 2017, Mexico.

This species is distinguished by the small spikelets and the densely villous axis of the panicle.

DISTRIBUTION.

TEPIC: Woods, between Aguacata and Dolores, *Rose* 2017.

17. **Chaetochloa corrugata** (Ell.) Scribn.

Panicum corrugatum Ell. Bot. S. C. & Ga. **1**: 113. 1816. "Sent to me from Savannah by Dr. Baldwin." The type, in the Elliott Herbarium, is the upper part of a culm with a panicle and one leaf.

Pennisetum corrugatum Nutt. Gen. Pl. **1**: 55. 1818. A nomen nudum, but probably based on *Panicum corrugatum* Ell. The name is given as a synonym of *Setaria corrugata* by Schultes.[1]

[1] Mant. **2**: 276. 1824.

Setaria corrugata Schult. Mant. **2**: 276. 1824. Based on *Panicum corrugatum* Ell.

Chamaeraphis corrugata Kuntze, Rev. Gen. Pl. **2**: 770. 1891. Based on *Panicum corrugatum* Ell.

Chaetochloa corrugata Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897. Based on *Setaria corrugata* Ell., an error for *Panicum corrugatum* Ell.

Chaetochloa hispida Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 25. *f. 13.* 1900. "In sandy pine woods. Type specimen in the Gray Herbarium, collected [at La Grifa, Pinar del Río, Cuba] by C. Wright in January, 1865, no number." This specimen agrees with *Chaetochloa corrugata*, except that the blades are somewhat hispidulous, as are also the sheaths. The sheaths are not infrequently appressed-pilose in Florida specimens. Hitchcock's no. 519 from Marco, Florida, with hispid sheaths, was identified by Merrill as *C. hispida*.

Setaria hispida Schum. Just's Bot. Jahresb. **28**[1]: 417. 1902. Based on *Chaetochloa hispida* Scribn. & Merr.

The plants described by Scribner and Merrill[1] under *Chaetochloa corrugata pa. viflora* are here included under *C. corrugata*, but the name is a synonym of *C. geniculata*.

FIG. 51.—*Chaetochloa corrugata*. From *Pollard & Collins* 253, Florida.

DESCRIPTION.

Plants annual, branched at base, erect or geniculate-spreading; culms scabrous, or the lower part smooth, more or less appressed-hispid at the nodes, as much as 1 meter tall; sheaths compressed-keeled, scabrous at least toward the summit, villous on the margin or sometimes appressed-pilose all over; ligule a densely ciliate membrane about 1 mm. long; blades flat, gradually narrowed to the base and to the acuminate apex, scabrous on both surfaces, as much as 30 cm. long and 1 cm. wide, the middle culm blades commonly 15 to 25 cm. long and less than 5 mm. wide, rarely sparsely pilose; panicles densely flowered, cylindric, in larger specimens sometimes interrupted at base, as much as 15 cm. long, usually less than 10 cm., the axis densely hispid-scabrous, and also rather densely villous with ascending hairs about 1 mm. long; branches 1 to 3 mm. long, hairy, bearing several spikelets (mostly 5 or 6), and 1 to 3 bristles below each spikelet; bristles somewhat flexuous, antrorsely scabrous, mostly about 3 times as long as the spikelets, or as much as 2 cm. long, green, tawny, or purple spikelets about 2 mm. long, turgid on the convex side; first glume about half as long as the spikelet, 3-nerved; second glume a little shorter than the spikelet, 5-nerved; sterile lemma as long as the spikelet, 5-nerved; fertile lemma coarsely transversely rugose.

DISTRIBUTION.

Sandy woods, along the coast and also a weed in cultivated fields and waste places, North Carolina to Florida and Mississippi; also in Cuba.

NORTH CAROLINA: Wilmington, *Hitchcock* 201. Newbern, *Kearney* 2221.

FLORIDA: Hillsborough County, *Fredholm* 6401. Eustis, *Biltmore Herb.* 10340; *Nash* 640, 1382; *Hitchcock* 2352. Jacksonville, *Curtiss* 3616, 4041, 5124. Miami, *Pollard & Collins* 253; *Hitchcock* 645; *Eaton* 337; *Chase* 3909, 3952. Lake City,

[1] U. S. Dept. Agr. Div. Agrost. Bull. **21**: 24. *f. 12.* 1900.

Combs 83, 140; *Rolfs* 712, 760, 829, 845. Sneeds Island, *Tracy* 6704. Grasmere, *Combs* 1047. Cedar Key, *Combs* 795; Tracy 7179. Levy County, *Hitchcock* 2354. Titusville, *Chase* 3972. Palm Beach, *Hitchcock* 2351. Fort Myers, *Standley* 13055. Manivista, *Tracy* 6697. Gainesville, *Combs* 721, 723. East Pass, *Tracy* 6449. Homosassa, *Combs* 944, 945. Palmetto, *Tracy* 7040. Bartow, *Combs* 1177. Manatee, *Rugel* 366, 369. Alva, *Hitchcock* 517. Anastasia Island, *Kearney* 175. Apalachicola, *Kearney* 108. Jensen, *Hitchcock* 740. Old Town, *Combs* 865. Braidentown, *Combs* 1287, 1292. Dunnellon, *Combs* 914a. New River, *Hitchcock* 2353. Marco, *Hitchcock* 519. Duval County, *Fredholm* 187, 328.

ALABAMA: Mobile, *Hitchcock* in 1904.
MISSISSIPPI: Cat Island, *Tracy* 436.
CUBA: Isle of Pines, *Britton & Wilson* 14817. La Grifa, Pinar del Río, *Wright* (Gray Herb.).

18. **Chaetochloa liebmanni** (Fourn.) Scribn. & Merr.

Setaria rariflora Presl, Rel. Haenk. **1:** 313. 1830. Not *Setaria rariflora* Mikan, 1821. "Hab. ad Acapulco." The type, in the herbarium of the German University at Prague, is the small form like the variety *pauciflora*. It is labeled "Mexico. H."

Panicum rariflorum Presl; Steud. Syn. Pl. Glum. **1:** 51. 1854. Based on *Setaria rariflora* Presl.

Panicum dissitiflorum Steud. Syn. Pl. Glum. **1:** 51. 1854, as synonym of *P. rariflorum* Presl.

Setaria liebmanni Fourn. Mex. Pl. **2:** 44. 1886. "Manantial, augusto (LIEBM. n. 389)." The type specimen, in the Copenhagen Herbarium, consists of a culm with several broad blades and a panicle about 20 cm. long from which most of the spikelets have fallen. The label reads, "Pl. Mexic. Liebm. Gramineae n. 389. *S. Liebmanni* (scripsit Fournier) Manantial. 8/41." The locality is uncertain, but it must be in Veracruz since Liebmann did not go outside of that state during 1841.

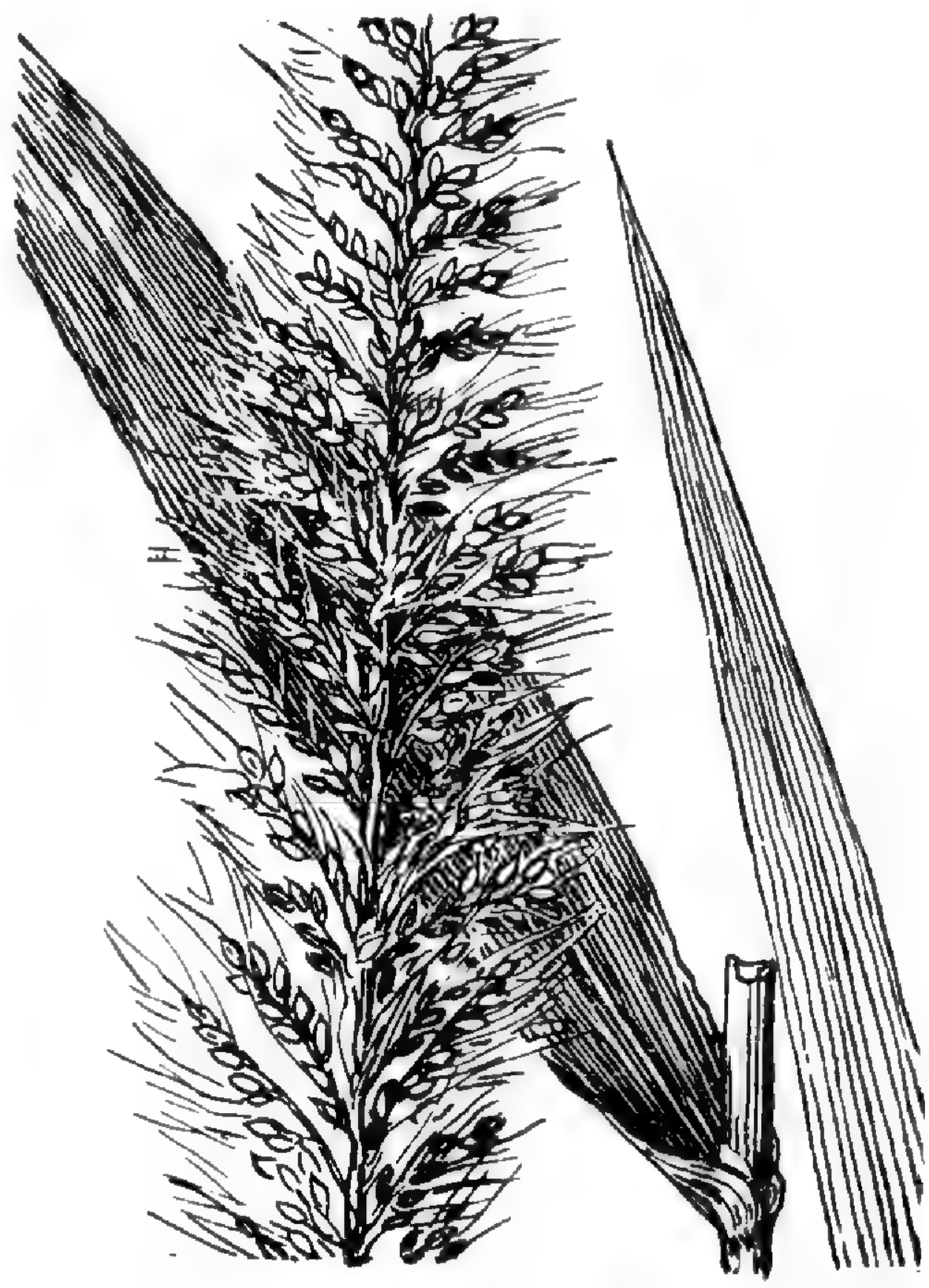

FIG. 52.—*Chaetochloa liebmanni*. From *Palmer* 52 in 1885, Mexico.

Chamaeraphis caudata pauciflora Vasey; Beal, Grasses N. Amer. **2:** 158. 1896. "California, *Palmer* 191." Palmer's no. 191 was not collected in California, but at Guaymas, Sonora. The type specimen is in the herbarium of the Michigan Agricultural College. This, like the duplicates of this collection, is a small form with blades 5 to 7 mm. wide, and panicles 5 to 9 cm. long, narrow, few-flowered, the branches mostly not over 5 mm. long, a few as much as 1 cm. long.

Chaetochloa liebmanni Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21:** 31. 1900. Based on *Setaria liebmanni* Fourn.

Chaetochloa liebmanni pauciflora Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21:** 33. 1900. Based on *Chamaeraphis caudata pauciflora* Vasey.

DESCRIPTION.

Plants annual, often branched at base; culms as much as 1 meter tall, usually less than 50 cm., glabrous, scabrous just below the panicle, the nodes glabrous or puberulent; sheaths glabrous, the margin ciliate, the collar a more or less hispidulous ridge; ligule a short, densely ciliate membrane; blades flat, rather thin, as much as 20 cm. long and 2 cm. wide, usually about 1 cm. wide, narrowed toward both ends, scabrous, especially beneath; panicles loosely flowered, cylindric, tapering at each end, often nodding or flexuous, as much as 30 cm. long, usually 10 to 20 cm., the axis angled or channeled, scabrous or scabrous-hispidulous; branches ascending, loosely arranged, scabrous like the axis, as much as 2.5 cm. long; branchlets less than 1 mm. long, bearing one bristle below each spikelet; bristles slender, flexuous, antrorsely scabrous, 7 to 15 mm. long; spikelets ovate, about 2 mm. long, rather turgid on the convex side, rather prominently nerved; first glume one-third or one-fourth as long as the spikelet, 3-nerved; second glume about four-fifths as long as the fertile lemma, 5-nerved, with an additional accessory pair on the outside; sterile lemma as long as the fertile, 5-nerved, with an accessory pair like the second glume, the palea wanting; fertile lemma somewhat pointed, gibbous, coarsely and strongly transversely rugose.

DISTRIBUTION.

Open sandy or rocky soil, Arizona to Oaxaca.

ARIZONA: Tucson. *Thornber* 171 (N. Y. Bot. Gard. Herb.).

LOWER CALIFORNIA: Arroyo San Lazaro, *Brandegee* in 1902. San José del Cabo, *Brandegee* 12 in 1890.

SONORA: Alamos, *Palmer* 686 in 1890. Guaymas, *Hitchcock* 3548; *Palmer* 191 in 1887. Hermosillo, *Hitchcock* 3607.

CHIHUAHUA: Batopilas, *Palmer* 52 and 110D in 1885.

SINALOA: Rosario, *Rose* 1840. Culiacán, *Palmer* 1541 in 1891; *Brandegee* in 1904. Topolobampo, *Palmer* 233 in 1897.

TEPIC: Acaponeta, *Rose* 3303.

VERACRUZ: Baños del Carrizal, *Purpus* 6211.

COLIMA: Colima, *Palmer* 8 and 142 in 1897. Manzanillo, *Hitchcock* 7026; *Orcutt* 4481.

GUERRERO: Balsas, *Hitchcock* 6774, 6786; *Orcutt* 4194.

OAXACA: Tomellín, *Hitchcock* 6191. Between San Gerónimo and La Venta, *Nelson* 2788.

NICARAGUA: Masaya, *Hitchcock* 8661. San Juan del Sur, *Hitchcock* 8599.

19. **Chaetochloa latifolia** Scribn.

Chaetochloa latifolia Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **11**: 44. *pl. 3*. 1898. "Growing under bushes in deep ravines, Durango, Mexico (No. 879, E. Palmer, 1896)." The type specimen, in the National Herbarium, is shown in plate 3, which, however, exaggerates the nerving and hispidity of the leaves. The type sheet includes two other specimens.

Chaetochloa latifolia breviseta Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 31. 1900. The first specimen cited, "Mexico: Oaxaca, 347 *Conzatti & Gonzalez*, 1897," in the National Herbarium, is marked "type" in Merrill's hand. This form has shorter and fewer bristles but is otherwise the same as the typical form.

Setaria latifolia Herrm. Beitr. Biol. Pflanz. **10**: 55. 1910. Presumably based on *Chaetochloa latifolia* Scribn. No synonym is cited, but Scribner's name is given in parentheses.

DESCRIPTION.

Plants annual, branching at the base; culms erect or geniculate-spreading, 20 to 40 cm. tall, more or less scabrous, especially below the hispidulous or pubescent nodes and below the panicle; sheaths papillose-hispid, papillose only, or glabrate, densely

ciliate; ligule a densely ciliate membrane less than 1 mm. long; blades flat, mostly less than 10 cm. long, as much as 1.5 cm. wide, rounded or somewhat cordate at base, rather abruptly narrowed at the apex, scabrous and also sparsely papillose-hispid; panicles loosely cylindric, tapering above, more or less interrupted or lobed, mostly 5 to 8 cm. long, the axis scabrous or pubescent and also villous, the hairs weak and spreading, 1 mm. long; branches short, ascending, the longer as much as 5 mm. long; branchlets about 1 mm. long, bearing a single bristle below the spikelets; bristles flexuous, angled, antrorsely scabrous, 5 to 10 mm. long; spikelets about 2 mm. long or a little longer, moderately turgid on the convex side; first glume one-third the length of the spikelet, 3-nerved; second glume a little shorter than the fertile lemma, 5-nerved; sterile lemma as long as the fertile, 5-nerved, the palea well developed; fertile lemma strongly and coarsely transversely rugose.

FIG. 53.—*Chaetochloa latifolia*. From type specimen.

DISTRIBUTION.

Rocky hills and shady places, Durango to Oaxaca; also in Brazil.

DURANGO: Durango, *Palmer* 470 and 879 in 1896; *Hitchcock* 7643.

OAXACA: Oaxaca, *Conzatti & González* 343; *Hitchcock* 6105.

BRAZIL: Piauhy, *Gardner* 2354.

20. **Chaetochloa macrosperma** Scribn. & Merr.

Chaetochloa macrosperma Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 33. *f. 18*. 1900. "*Setaria composita* of Chapman's Fl. So. U. S. and of Bul. 7: 85. fig. 67, U. S. Dept. Agr., Div. Agros., not of H. B. K." No type is designated. In the National Herbarium is a specimen bearing the name and marked "type" and bearing also detailed drawings of the spikelet and a statement that the drawing (figure 18) was made from this plant. This specimen, *Curtiss* 3617, collected on "Shell mounds at the mouth of St. Johns River, Florida," is the first one cited by Scribner and Merrill and may be accepted as the type. If one looks upon the publication of *C. macrosperma* as a change of name only, it would be based upon *Setaria composita* of Chapman's Flora as cited above. In the National Herbarium is a specimen from Chapman without locality, marked *Setaria composita* S. Fl.!, which represents the latter species as understood by Chapman.

Setaria macrosperma Schum. Just's Bot. Jahresb. **28**[1]: 417. 1902. Based on *Chaetochloa macrosperma* Scribn. & Merr.

DESCRIPTION.

Plants perennial, often in large tufts; culms usually more or less geniculate at base, and often rooting at the lower nodes, smooth, scabrous below the panicle, rather stout, mostly 1 to 1.5 meters tall, the nodes glabrous; sheaths keeled, glabrous, villous

on the margin, usually hispidulous on the collar; ligule a ciliate membrane, 1 to 3 mm. long; blades flat, very scabrous on the upper surface, smooth or scaberulous beneath, narrowed at the base, as much as 50 cm. long and 2 cm. wide; panicles rather loose, tapering above, as much as 25 cm. long, the secondary panicles often much smaller and more compact, the branches ascending, as much as 2 cm. long, about equally distributed, the panicle thus not being interrupted or lobed, the axis scabrous-pubescent and also loosely or sparsely villous with hairs 1 to 2 mm. long, the hairs rarely wanting; bristles single below each spikelet but often seemingly in pairs because of the abortion of spikelets, straight or obscurely flexuous, antrorsely scabrous, 1.5 to 3 cm. long, greenish or yellowish; spikelets about 3 mm. long, lanceolate-ovate, not strongly turgid on the convex side, pale or greenish; first glume about one-third the length of the spikelet, 3-nerved; second glume two-thirds to three-fourths as long as the fertile lemma, mostly 5-nerved, sometimes 6 or 7-nerved; sterile lemma as long as the fertile, 5-nerved, concave or sulcate, the palea narrow, about half as long as its lemma; fertile lemma pale, acute or somewhat pointed, finely and not very distinctly cross-wrinkled, the surface appearing cellular.

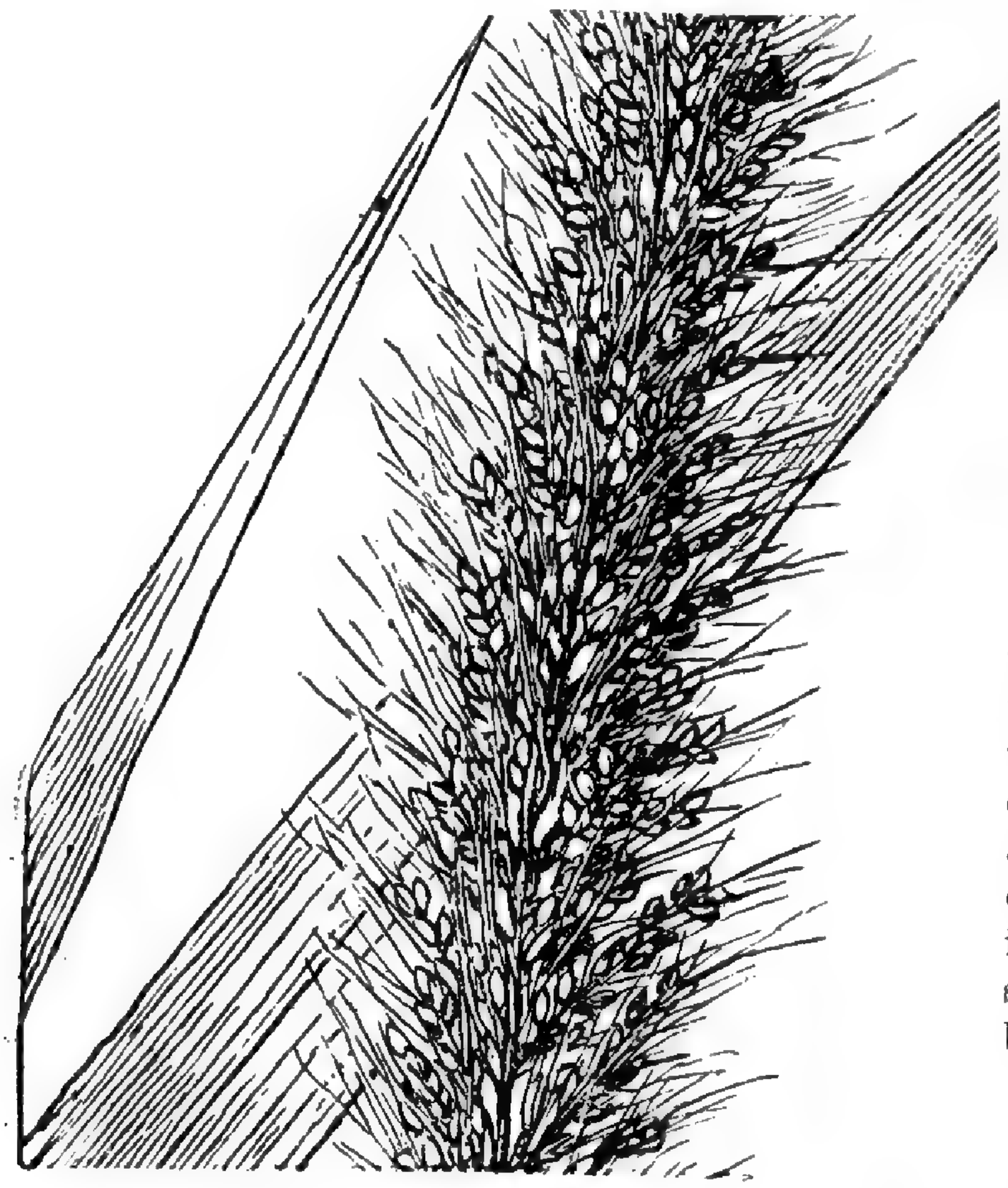

FIG. 54.—*Chaetochloa macrosperma*. From *Curtiss* 3617, Florida.

The wider-leaved specimens of this species resemble *Chaetochloa vulpiseta*, but differ from that species in the larger spikelets. The latter character and the scabrous blades distinguish it from *C. scheelei* of Texas. From *C. villosissima* of Texas, with equally large spikelets, it is distinguished by the scabrous instead of villous blades.

DISTRIBUTION.

Open ground, mostly on coral rock or coral sand, Florida and the Bahamas.

FLORIDA: Homosassa, *Combs* 977. Orange, *Baker* in 1899. Apalachicola, *Chapman* in 1896. Mouth of St. Johns River, *Curtiss* 3617. Grasmere, *Combs* 1150. Brevard County, *Fredholm* 5559. Sneeds Island, *Tracy* 6462. Captiva, *Orrok* in 1915. Caloosa River, *Garber* 41 in 1878. Eustis, *Chase* 4123. Miami, *Tracy* 9053; *Chase* 3848; *Eaton* 337; *Hitchcock* in 1903. East Pass, *Tracy* 6459. Crystal, *Combs* 979½. Fort Myers, *Hitchcock* 518. Snapper Creek, *Small & Nash* 103. Ragged Keys, *Small & Carter* 2879. Howes Key, *Simpson* 263. Key Largo, *Curtiss* 5502. Key West, *Blodgett*.

BAHAMAS: Frozen Cay, Berry Islands, *Britton & Millspaugh* 2203 (N. Y. Bot. Gard. Herb.).

21. Chaetochloa villosissima Scribn. & Merr.

Chaetochloa villosissima Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 34. *f. 19*. 1900. "Type specimen collected by J. G. Smith at San Diego, Tex., May, 1897. Limpia Canyon, Presidio Co., 115 (in part) Nealley 1892, a smaller undeveloped specimen, with much less pubescent leaves, otherwise as in the type." The type specimen, the original of the illustration, is in the National Herbarium.

Setaria villosissima Schum. Just's Bot. Jahresb. **28**[1]: 417. 1902. Based on *Chaetochloa villosissima* Scribn. & Merr.

DESCRIPTION.

Plants perennial; culms erect or decumbent at base, glabrous, as much as a meter tall, the nodes more or less pubescent; sheaths glabrous or somewhat hispidulous, often scabrous toward the summit, compressed-keeled, especially the lower, hispid on the collar, villous on the margin; ligule densely pilose, 2 to 3 mm. long; blades flat, scabrous and villous, or scabrous only, 15 to 30 cm. long, 5 to 8 mm. wide; panicles rather loose, more or less interrupted, tapering at the summit, as much as 23 cm. long, the branches ascending, the lower as much as 2 cm. long, the axis angled, scabrous, villous; bristles single below each spikelet, flexuous, antrorsely scabrous, 1.5 to 2.5 cm. long; spikelets lanceolate-ovate, acutish, not strongly turgid on the convex side, about 3 mm. long, pale or greenish; first glume one-third as long as the spikelet, 3-nerved; second glume nearly as long as the fertile lemma, 5-nerved (rarely 7-nerved); sterile lemma as long as the fertile, 5-nerved, convex or sulcate, the palea narrow, less than 1 mm. long; fertile lemma lanceolate, the tip rather pointed, incurved, the surface finely but sharply cross-wrinkled.

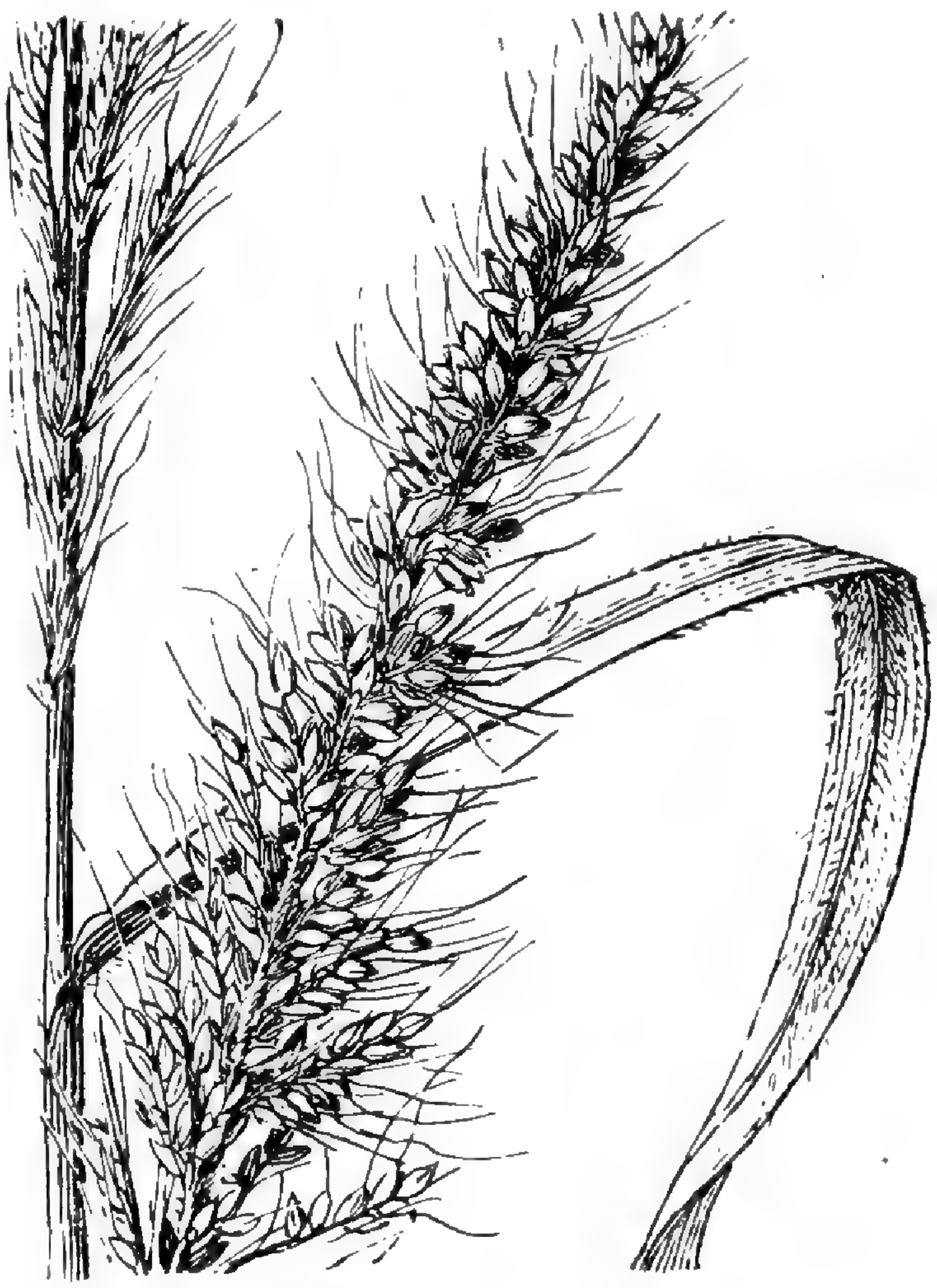

FIG. 55.—*Chaetochloa villosissima*. From type specimen.

This species is little known. The description is drawn chiefly from the type, in which the blades are villous on both surfaces. Nealley's no. 115 (Limpia Canyon, Presidio County, Texas), with only sparingly short-pilose blades, appears to be this species, though the plant is only 40 cm. tall and the panicle 10 cm. long and few-flowered, the branches very short. Two specimens from Arizona (no definite locality), *Emersley* 19 and 21 in 1890, may also belong to this species. The blades are scabrous but not villous, and only 3 to 5 mm. wide. The first glume is almost half as long as the spikelet and pubescent near the margins. A sterile specimen from Big Spring, Texas (open woods along stream, 8 miles west of Sterling, *Hitchcock* 13401), with pubescent blades 1.5 cm. wide, may also belong to this species.

22. Chaetochloa setosa (Swartz) Scribn.

Panicum setosum Swartz, Prodr. Veg. Ind. Occ. 22. 1788. "Jamaica." The type specimen in the Swartz Herbarium at Stockholm, has a narrow, rather close panicle.

Panicum caudatum Lam. Tabl. Encycl. **1:** 171. 1791. "E Brasilio. *Commers.* & Cayenna. *D. Richard.*" The species is more fully described in the Encyclopedia.[1] It is said here, concerning the locality, "Cette espèce croît à Cayenne, & m'a été communiquée par le citoyen Richard. Comerson l'a trouvée au Brésil. Elle y forme une variété à grappe très-grêle, à peine barbue sur le rachis." The Richard specimen, in the Lamarck Herbarium at Paris, taken as the type, is a culm with several leaves and a panicle 20 cm. long, the lower branches 2 cm. long. It is labeled "ex D. Richard" and comes from Cayenne. The identification of this specimen is somewhat uncertain. It resembles specimens of *Chaetochloa setosa* from the West Indies, rather than the specimens from Brazil that have been referred to *C. caudata* and which in this paper are placed under *C. rariflora*. As noted above, Lamarck states that his Brazilian specimen has a more slender panicle and is less bristly. In the National Herbarium there are no specimens of *C. setosa* from southeast of Trinidad. There may be an error as to the origin of Richard's specimen, said to come from Cayenne. It may have come from the West Indies.

Setaria setosa Beauv. Ess. Agrost. 51, 178. 1812. Based on *Panicum setosum* Swartz.

Panicum brachiatum Poir. in Lam. Encycl. Suppl. **4:** 282. 1816. "Cette plante croît aux Antilles (V. s. in herb. Desfont.)." The type specimen, in the Desfontaines Herbarium at Florence, consists of a panicle and a fragment of a culm bearing a single leaf. The specimen is similar to *Chase* 6519, from Ensenada, Guanica Bay, Porto Rico, bearing the note "plant woody, main culm erect, branches divaricate, arid cleared limestone hillside." The plant is decumbent, sending up erect branches. The panicles are very open, bearing spreading or reflexed, distant branches, the lower as much as 4 cm. long. This specimen agrees with the type in having the axis of the panicle scabrous but not villous. Hitchcock's no. 9315, from dry woods along the coast east of Kingston, Jamaica, agrees with this in habit and shape of the panicle, but the axis is villous, as is usual in *C. setosa*. It was noted in both cases that other specimens in the vicinity showed gradations to the usual form of *C. setosa*. The open-panicled form, like the type of *Panicum brachiatum*, is found here and there, on dry brushy hillsides, but always associated with the more usual form. It is discussed further at the end of the description of *Chaetochloa setosa*.

Setaria caudata Roem. & Schult. Syst. Veg. **2:** 495. 1817. Based on *Panicum caudatum* Lam.

Setaria elongata Spreng.; Schult. Mant. **2:** 280. 1824. "In S. Domingo." Schultes states, "*Setaria elongata* Spreng. in litt. ad D. Balbis in Herb. Berteron." In the Berlin Herbarium is a specimen labeled "Hb. Sprengel. S. Domingo. Bertero lgt. Balbis ad Spr." (Herbarium Krug et Urban). This specimen, the type, is a somewhat open-panicled, short-bristled form of *Chaetochloa setosa*, intermediate between *Panicum brachiatum*, mentioned above, and the usual form of *Chaetochloa setosa*.

Setaria brachiata Kunth, Rév. Gram. **1:** 47. 1829. Based on *Panicum brachiatum* Poir.

Panicum paractaenoides Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. **1:** 219. 1834. "V. sp. e Krabbeneiland." The type specimen, collected in Crab Island (now called Vieques, near Porto Rico) by Hornemann, is in the Trinius Herbarium. It is a loose-panicled form much like the type of *Setaria elongata*, mentioned above, and similar to *Britton & Wheeler* 233, from Culebra.

Panicum dumetorum A. Rich.; Steud. Syn. Pl. Glum. **1:** 49. 1854. "Ins. Antillae." The type specimen, from St. Croix, is the open-panicled form like the types of *Setaria elongata* and *Panicum paractaenoides*.

Panicum restitutum Steud. Syn. Pl. Glum. **1:** 53. 1854. Based on *Setaria elongata* Spreng. (not *Panicum elongatum* Pursh, described by Steudel on page 71).

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[1] Lam. Encycl. **4:** 736. 1798.

Setaria setosa β *caudata* Griseb. Fl. Brit. W. Ind. 555. 1864. Based on *Panicum caudatum* Lam.

Pennisetum swartzii F. Muell. Fragm. Phyt. Austr. **8:** 110. 1873. Based on *Panicum setosum* Swartz (not *Pennisetum setosum* L. Rich.).

Chamaeraphis setosa Kuntze, Rev. Gen. Pl. **2:** 768. 1891. Based on *Panicum setosum* Swartz.

Chamaeraphis setosa α *caudata* Kuntze, Rev. Gen. Pl. **2:** 769. 1891. Based on *Panicum caudatum* Lam.

Chamaeraphis caudata Britton, Ann. N. Y. Acad. **7:** 264. 1893. Based on *Panicum caudatum* Lam.

FIG. 56.—*Chaetochloa setosa*. From *Hitchcock* 9846, Jamaica; typical form.

FIG. 57.—*Chaetochloa setosa*. From *Chase* 6519, Porto Rico open-paniceed form (*Panicum brachiatum*).

Chaetochloa setosa Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4:** 39. 1897. Based on *Panicum setosum* Swartz.

Chaetochloa caudata Scribn. Rep. Mo. Bot. Gard. **10:** 52. 1899. Based on *Panicum caudatum* Lam.

Setaria paractaenoides Urban, Repert. Nov. Sp. Fedde **15:** 98. 1917. Based on *Panicum paractaenoides* Trin.

DESCRIPTION.

Plants perennial; culms erect, spreading, or decumbent at base, often wiry, sometimes prostrate and woody at base, with upright branches, glabrous, scabrous below the panicle, sometimes hispidulous about the nodes, mostly not over 1 meter tall; sheaths glabrous or rarely pubescent, the lower often keeled, often overlapping, ciliate, hispidulous or rarely glabrous on the collar; ligule densely ciliate, about 1 mm. long; blades flat or folded, usually rather firm and stiffly spreading, glabrous beneath, scabrous on upper surface, or often pubescent on both surfaces, usually 15 to 20 cm. long, sometimes as much as 30 cm. long, mostly 5 to 10 mm. wide, sometimes wider;

panicles mostly narrow, sometimes loosely spikelike, sometimes rather open, attenuate at summit, usually 10 to 20 cm. long, rarely as much as 40 cm., the branches short and crowded or ascending and 1 to 2 cm. long, approximate or, especially the lower, 1 to 3 cm. distant, these rarely spreading or somewhat reflexed, the axis villous with hairs as much as 1 mm. long; bristles mostly one below each spikelet, flexuous, antrorsely scabrous, mostly 5 to 10 mm. long, sometimes scarcely exceeding the spikelets; spikelets about 2 mm. long, rather strongly turgid on the convex side; first glume nearly half as long as the spikelet, 3-nerved; second glume about two-thirds as long as the fertile lemma, 5-nerved; sterile lemma about as long as the fertile,5-nerved, the palea well developed; fertile lemma acutish, finely but strongly cross-ridged.

In habit this species is rather variable, the differences being due chiefly to the length of the bristles, the length and distance of the branches of the panicle, and the relative amount of foliage. The usual form has rather densely flowered panicles with short, ascending, approximate branches, and bristles 5 to 10 mm. long. An extreme form (*Panicum brachiatum* Poir.), growing on dry brushy hillsides, has wiry, often woody, sometimes decumbent and rooting stems, rather few and distant leaves, and loose panicles with distant, spreading, sometimes reflexed branches as much as 5 cm. long, and short bristles. However, there are all gradations to connect this with the usual form. This open-panicled form is represented by: JAMAICA, *Hitchcock* 9315; PORTO RICO, *Chase* 6519, 6536, *Britton, Cowell & Hess* 1604, *Britton & Wheeler* 233.

DISTRIBUTION.

Dry woods and rocky hills at low altitudes, West Indies to Colombia.

NEW JERSEY: On ballast, Camden, *Parker* in 1879.

BAHAMAS: Water Cay, *Geogr. Soc. Baltimore* 522.

CUBA: Cayo Paloma, *Shafer* 2565. Nuevo Gerona, *Palmer & Riley* 1000. Guantánamo, *Léon* 3775, 3776; *Britton* 1930, 2105. Santiago de Cuba, *Léon* 829, 830, 831, 3946.

JAMAICA: Spanish Town Road, *Harris* 9297, 12477. Kingston, *Hitchcock* 9315, 9745; *Amer. Gr. Nat. Herb.* 606; *Alexander* in 1855. Gordon Town, *Hart* 826, 829; *Hitchcock* 9325; *Harris* 11348, 11458. New Forest, *Hitchcock* 9846. Hope, *Harris* 11292. Long Mountain Road, *Harris* 11303, 11307. St. Andrew, *Harris* 11479. Without locality, *March.*

SANTO DOMINGO: Rincón, *Fuertes* 1378. Santiago, *Eggers* 2378.

PORTO RICO: Coamo, *Sintenis* 2987, 3197; *Chase* 6541. Cabo Rojo, *Sintenis* 853. Santa Rita, *Chase* 6536; *Johnston* 1027. Guanica, *Britton & Shafer* 1901. Desecheo, *Hess* 424, 426; *Britton, Cowell & Hess* 1604. Mona, *Hess* 447. Culebra, *Britton & Wheeler* 18, 233. Ensenada, *Amer. Gr. Nat. Herb.* 607; *Chase* 6519. Boqueron, *Chase* 6505. Ponce, *Chase* 6488.

VIRGIN ISLANDS: St. Croix, *Ricksecker* 407. St. Thomas, *Eggers* in 1882. St. Jan, *Britton & Shafer* 631.

LEEWARD ISLANDS: Guadeloupe, *Duss* 2698, 3188. Dominica, *Jones* 34.

TRINIDAD: Chacachacare, *Hitchcock* 10059.

COLOMBIA: Santa Marta, *Smith* 154, 2188.

23. **Chaetochloa rariflora** (Mikan) Hitchc. & Chase.

Setaria rariflora Mikan; Trin. in Spreng. Neu. Entd. **2:** 78. 1821. "Hab. in Brasilia." Trinius adds, "(Ich bin ungeweiss, ob dieses Gras nicht vielleicht das Panicum caudatum. Lam. sey.)". The type, in the Trinius Herbarium, has a spikelike few-flowered panicle. Trinius himself changed the name on the label to *Panicum caudatum* Lam.

Setaria vaginata Spreng. Syst. Veg. **4:** Cur. Post. 33. 1827. "Rio grande Sello." A duplicate type has been examined in the Vienna Herbarium.

Panicum triquetrum Willd.; Doell. in Mart. Fl. Bras. **2**[2]: 161. 1877, as synonym of *Panicum caudatum* Lam. The type is no. 18809 in the Willdenow Herbarium, sent by Vahl from "America" (probably Brazil).

Chaetochloa rariflora Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 349. 1917. Based on *Setaria rariflora* Mikan.

DESCRIPTION.

Plants perennial, tufted; culms erect, or decumbent at base, glabrous, mostly 30 to 60 cm. tall; sheaths pubescent with short ascending hairs or glabrate, keeled, mostly overlapping; ligule densely ciliate, less than 1 mm. long; blades elongate and narrow, pubescent on both surfaces, narrowed at base, usually 2 to 3 mm. wide, rarely over 5 mm.; panicles narrow, tapering above, 10 to 15 cm. long, often less, the axis loosely villous, the hairs mostly less than 1 mm. long; branches ascending, the lower 5 to 10 mm. long, or often shorter, rarely longer, the panicle then being loosely or interruptedly spikelike; bristles usually one below each spikelet, flexuous, antrorsely scabrous, 4 to 7 mm. long, or often scarcely exceeding the spikelets; spikelets about 2 mm. long, turgid on the convex side; first glume a little less than half the length of the spikelet, 3-nerved; second glume about two-thirds as long as the spikelet, 7-nerved; sterile lemma as long as the fertile, 5 to 7-nerved, the palea well developed; fertile lemma acutish, finely and sharply cross-ridged.

FIG. 58.—*Chaetochloa rariflora*. From *Ricksecker* 67, St. Croix.

This species differs from *C. setosa* chiefly in the long narrow blades and the usually narrower and less bristly panicle. The second glume is shorter and usually 7-nerved. The two forms are given specific rank because the specimens from Brazil agree in having slender, rather lax blades and narrow, few-flowered, interruptedly spikelike panicles like the type of *C. rariflora*. *Chaetochloa setosa* is confined to the West Indies and adjacent parts of South America. There are no specimens known from Brazil. In Trinidad it is found only on the outlying islet Chacachacare. Because of the slightly different aspect and the different geographical range it seems better to recognize the two forms as species rather than varieties, though they are closely related.

DISTRIBUTION.

Dry hills, Porto Rico to Brazil.

ALABAMA: On ballast, Mobile, *Mohr* in 1892.

PORTO RICO: "Under cactus on cliff facing sea," Boqueron, *Chase* 6502.

VIRGIN ISLANDS: St. Croix, *Ricksecker* 67.

LEEWARD ISLANDS: Antigua, *Wullschlaegel* 629.

BRAZIL: Bahia, *Dorsett & Popenoe* 433b. Rio de Janeiro, *Langsdorff; Widgren* in 1844; *Wilkes Expl. Exped.; Rose* 20188, 20214. Without locality, *Burchell* 1251; *Glaziou* 16574; *Gardner* 139; *Riedel*.

24. Chaetochloa vulpiseta (Lam.) Hitchc. & Chase.

Panicum vulpisetum Lam. Encycl. **4:** 735 (err. typ. 745). 1798. "Ce beau *panic* croît à Saint-Domingue, où il a été recueilli par le citoyen Dutrone. (V. s. in herb. D. Desfontaines.)" The type, in the Desfontaines Herbarium at Florence, is labeled "*Panicum vulpisetum* Lam. Dict." A second label bears the note "Bosc. Am. Sept." The type is said to have been collected in Santo Domingo by Dutrone. There is, consequently, some uncertainty as to the origin of the specimen, but the label first quoted above is similar in form to those generally accompanying Lamarck's types; the other is in a different hand.

Setaria composita H. B. K. Nov. Gen. & Sp. **1**: 111. 1816. "Crescit regione calidissima prope Cumana et Bordones, in Nova Andalusia," (Venezuela). The type has not been examined but the description, especially that of the panicle as nearly a foot long, the apex nodding, and the branches spreading, applies perfectly to *Jahn* 462 from Venezuela, as well as to the other specimens of *C. vulpiseta* from northern South America. The statement that the species is related to *Panicum italicum* strengthens this identification, for the large thick panicle and broad blades might easily suggest the cultivated millet. The description does not apply to the species of the southwestern states and Mexico which has been going under the name of *C. composita*. Neither is that species known from south of Mexico.

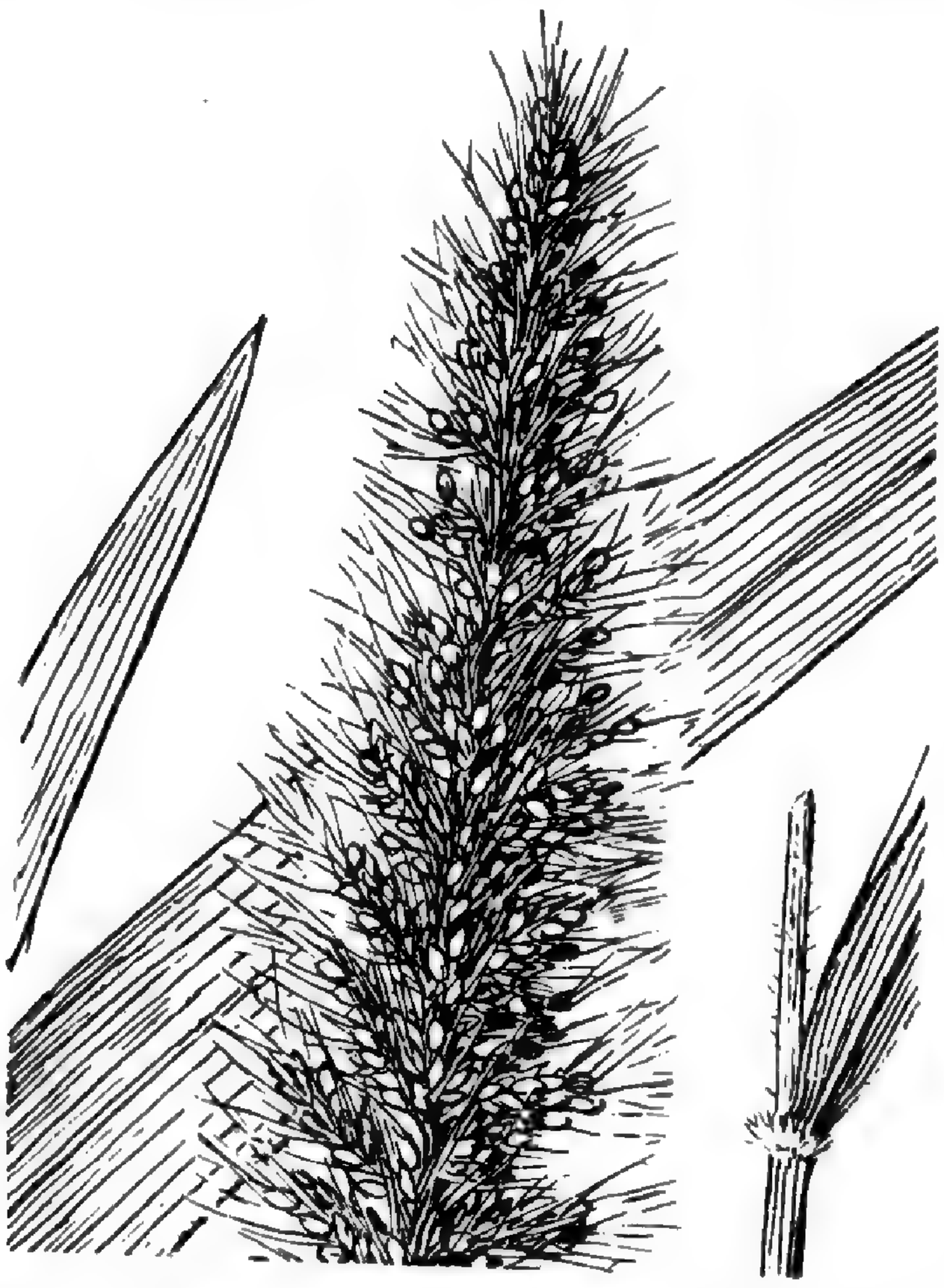

FIG. 59.—*Chaetochloa vulpiseta*. From *Stevenson* 3024, Porto Rico.

Setaria vulpiseta Roem. & Schult. Syst. Veg. **2**: 495. 1817. Based on *Panicum vulpisetum* Lam.

Setaria polystachya Schrad.; Schult. Mant. **2:** 277. 1824. "In Brasilia. Sereniss. Princeps Maximil. Neowidensis." The type has not been examined, but the detailed description can apply only to this one of the known species of Brazil.

Panicum compositum Nees, Agrost. Bras. 244. 1829. Not *Panicum compositum* L. 1753. Based on *Setaria composita* H. B. K.

Panicum macrourum Trin. Mém. Acad. St. Pétersb. VI. **3**[2]: 227. 1834. "V. spp. Bras." The type, in the Trinius Herbarium at the Academy of Sciences, Petrograd, was collected in Brazil by Sellow. This specimen is labeled also *Panicum macrostachyum*. Trinius indicated by his synonymy that he was applying the name *macrourum* to what had been called *macrostachyum*. A second specimen (Bahia, *Riedel* 183) bears Trinius's label "*Panicum macrourum* m.", but no synonymy is given.

Setaria alopecurus "hort. Gor."; Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. **1**: 227. 1834, as synonym of *Panicum macrourum*. The type, in the Trinius Herbarium, is from the garden at Gorenki.

Panicum amplifolium Steud. Syn. Pl. Glum. **1**: 53. 1854. "*Setaria macrostachya* Hochst. in Hrbr. Kappleri nr. 1411. Surinam." A fragment of this collection is in the National Herbarium.

Panicum subsphaerocarpum Salzm.; Schlecht. Linnaea **31**: 483. 1862. "Salzm. pl. exsicc. 'Bahia in fruticetis.'" Schlechtendal compares this with the preceding species (*P. macrostachyum*), pointing out slight differences in the size of the blades.

Chamaeraphis setosa var. *vulpiseta* Kuntze, Rev. Gen Pl. **2**: 769. 1891. Based on *Panicum vulpisetum* Lam.

Chamaeraphis composita Kuntze; Beal, Grasses N. Amer. **2**: 154. 1896. Based on *Setaria composita* H. B. K.

Chaetochloa composita Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4**: 39. 1897. Based on *Setaria composita* H. B. K.

Chaetochloa vulpiseta Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 350. 1917. Based on *Panicum vulpisetum* Lam.

DESCRIPTION.

Plants perennial, branching at base, often in large tufts; culms glabrous, stout, often decumbent at base, as much as 2 meters tall; sheaths keeled, glabrous, or scaberulous or hispidulous toward the summit or rarely all over, hispid on the margin and densely hispid on the well-marked ridge of the collar, the hairs yellowish, as much as 4 mm. long; ligule densely hispid like the collar, 2 mm. long; blades flat, gradually narrowed from the middle toward both ends, the larger somewhat plaited, scabrous, especially beneath, as much as 50 cm. long and 3 cm. wide; panicles rather densely and evenly flowered, tapering toward the apex and often somewhat tapering at base, as much as 30 cm. long and 4 or 5 cm. wide (secondary panicles much smaller, sometimes only 5 cm. long), the branches stiffly ascending or spreading, as much as 2 or 3 cm. long and of about equal length except toward the summit, the axis densely villous; bristles 1 or 2 at the base of each spikelet, slightly flexuous, brownish, antrorsely scabrous, mostly 1 to 2 cm. long, appearing secund on the branches after the fall of the spikelets; spikelets ovoid, 2 to 2.5 mm. long, pale, moderately turgid on the convex side; first glume about half as long as the spikelet, 3-nerved; second glume two-thirds to three-fourths as long as the fertile lemma, 7-nerved; sterile lemma as long as the fertile, 5-nerved, the palea well developed; fertile lemma lanceolate, acutish, strongly and rather coarsely cross-wrinkled.

The panicles sometimes resemble those of *C. magna* but are less densely flowered; the fertile lemma is cross-wrinkled instead of nearly smooth. From *C. macrosperma* it is distinguished by the smaller spikelets.

DISTRIBUTION.

Open ground and brushy slopes, West Indies and southern Mexico to Argentina.

TABASCO: San Antonio, *Rovirosa* 254 (N. Y. Bot. Gard. Herb.).
GUATEMALA: Nenton, *Seler* 2716.
HONDURAS: San Pedro Sula, *Thieme* 5582, 5582B. Without locality, *Thieme* 5574.
SALVADOR: San Salvador, *Renson* 296.
NICARAGUA: Jinotepe, *Hitchcock* 8683.
COSTA RICA: Colonia Carmona, *Jiménez* 368. Las Delicias del Reventazón, *Pittier* 16171.
PANAMA: Puerto Obaldía, *Pittier* 4332. Culebra, *Pittier* 2121; *Hitchcock* 7898, 7906, 8026. Gorgona, *Maxon* 4734. Las Cascadas, *Pittier* 3744. Taboga Island, *Hitchcock* 8093. Toro Point, *Hitchcock* 8046. Gatún Lake, *Pittier* 6850.
PORTO RICO: Jayuya, *Sintenis* 6335. San Juan, *Chase* 6371. Rio Piedras, *Stevenson* 3024.
TRINIDAD: *Bot. Gard. Herb.* 3304; *Crueger*
TOBAGO: *Broadway* 4898.

COLOMBIA: Santa Marta, *Smith* 501. Without locality, *Lehmann* 7688.
VENEZUELA: El Limón, *Jahn* 462.
DUTCH GUIANA: Paramaribo, *Samuels* in 1916.
BRAZIL: Tijuca, *Ball* in 1882. Rio de Janeiro, *Graham*; *Wilkes Expl. Expd.*; Corumbá, *Malme* 3077; *Anderson* in 1851. Bahia, *Löfgren* 3737. Goyaz, *Gardner* 3518. Campinas, *Campos Novaes* 1241. Espirito Santo, *Capanema* 5399. Tubarão, *Ule* 1367. Without locality, *Burchell* 1629; *Bot. Gard. Rio Jan.* 135, 993; *Capanema* 5405.
PARAGUAY: Central Paraguay, *Morong* 546, 658, 673. Pilcomayo River, *Morong* 1574; *Rojas* 84, 459.
PERU: Santa Ana, *Cook & Gilbert* 1548.
ARGENTINA: Misiones, *Ekman* 668.

25. **Chaetochloa macrostachya** (H. B. K.) Scribn. & Merr.

Setaria macrostachya H. B. K. Nov. Gen. & Sp. **1:** 110. 1816. "Crescit in planitie montana Mexicana inter Salamanca et Zelaya [State of Guanajuato]." *Panicum setosum* is cited as a synonym. The type has not been examined, but from the highlands of central Mexico there is no species other than the one described below that corresponds to the original description of *Setaria macrostachya.*

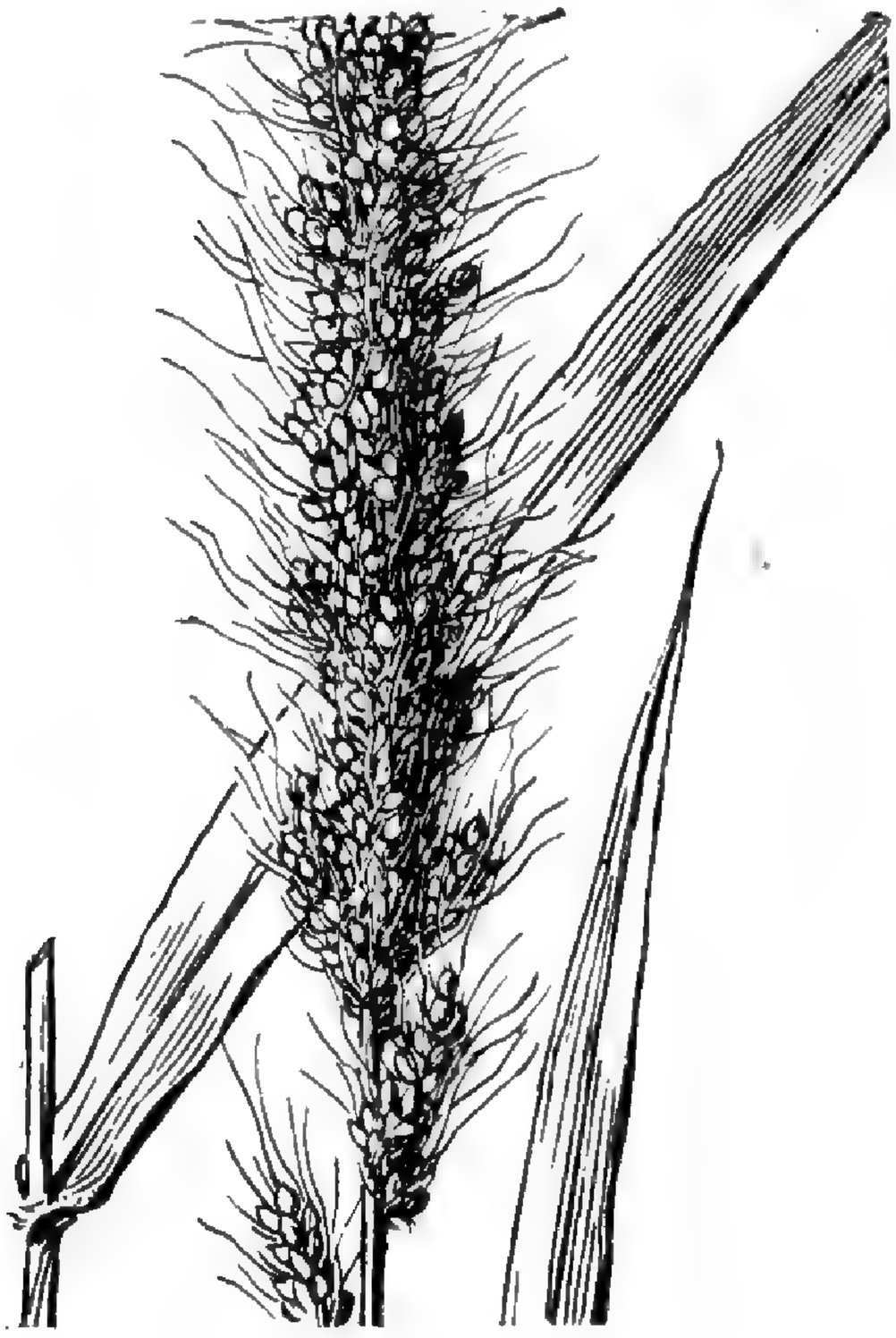

FIG. 60.—*Chaetochloa macrostachya.* From *Hitchcock* 5808, Mexico; typical form.

Panicum macrostachyum Nees, Agrost. Bras. 245. 1829. Based on *Setaria macrostachya* H. B. K. Nees[1] based his concept of *Setaria macrostachya* on a specimen from Humboldt in the Willdenow Herbarium from "America merid." which is *Chaetochloa vulpiseta.* Nees's description applies to this species. Doell[2] follows Nees in this concept.

Panicum onurus Willd.; Nees, Agrost. Bras. 251. 1829. This is mentioned as a synonym under *Panicum caudatum* var. β, "culmo ramoso, racemis angustioribus depauperatis (P. Onurus, *Willd.* Herb.—ex Humboldtianis)." In the paragraph on distribution Nees says, "β in regno Mexicano (ab Humb.—Vidi in Herb. Willd.)." The type specimen, no. 18813 in Willdenow Herbarium, was kindly sent to me for examination by Dr. Urban. The specimen is in an unsatisfactory condition, as the panicles are immature. The foliage resembles that of *Chaetochloa setosa,* a West Indian species, to which the specimen was previously referred.[3] On reconsideration, this specimen is referred to *C. macrostachya,* a Mexican species. It is not *Setaria onurus* as described by Grisebach (see under *Chaetochloa tenax*, page 177).

Chamaeraphis setosa var. *macrostachya* Kuntze, Rev. Gen. Pl. **2:** 769. 1891. Based on *Setaria macrostachya* H. B. K.

Chaetochloa gibbosa Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21:** 24. 1900. "Type specimen in Gray Herbarium, Cambridge, No. 528 (828?) 'Herbarium Ber-

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[1] Agrost. Bras. 245. 1829.
[2] In Mart. Fl. Bras. **2**[2]: 166. 1877.
[3] Contr. U. S. Nat. Herb. **18:** 349. 1917.

landierianum Texano Mexicanum,' no locality or date." The type specimen bears 3 panicles, all past maturity and containing only a few spikelets. It resembles *Pringle* 1968 in the pilose blades but the panicles are shorter and more compact. The label bears the following, "de Santander a Victoria" (probably in Tamaulipas).

Chaetochloa leucopila Scribn. & Merr. U. S. Dept. Agt. Div. Agrost. Bull. **21**: 26. *f. 14*. 1900. "Type specimen collected at Parras, state of Coahuila, Mexico, 1363 E. Palmer, June 1880." The type specimen, in the National Herbarium, in habit resembles the narrow-leaved form of *C. macrostachya*, with narrow slender panicles, a form common in Texas. It differs, however, in the pilose upper surface of the narrow folded blades.

Chaetochloa macrostachya Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 29. *f. 16*. 1900. Based on *Setaria macrostachya* H. B. K.

Chaetochloa rigida Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21**: 30. 1900. "Lower California: La Paz, 125 E. Palmer 1890 (type)." Two other specimens are cited, Carmen Island, *Palmer* 857 in 1890 and San José del Cabo, *Brandegee* 28 in 1890. See further notes at the end of the description of *C. macrostachya*.

Setaria leucopila Schum. Just's Bot. Jahresb. **28**[1]: 417. 1902. Based on *Chaetochloa leucopila* Scribn. & Merr.

Chamaeraphis macrostachya Kuntze; Stuck. Anal. Mus. Nac. Buenos Aires **11**: 76. 1904, in a footnote. Based on *Setaria macrostachya* H. B. K.

FIG. 61.—*Chaetochloa macrostachya*. From *Hitchcock* 13605, Texas; slender-panicled form.

DESCRIPTION.

Plants perennial, tufted, usually pale or glaucous, more or less hirsute around the base; culms erect or geniculate at base, scabrous below the panicle and usually below the glabrous or hispidulous nodes, 40 to 120 cm. tall; sheaths more or less compressed-keeled, glabrous or usually scaberulous toward the summit, rarely pubescent, ciliate on the margin, the collar hispidulous or glabrous; ligule densely ciliate, 1 to 3 mm. long; blades flat or folded, scabrous on the upper surface, smooth or scabrous beneath, rarely pubescent on both surfaces, 15 to 40 cm. long, 3 to 5 mm. wide; panicles spikelike, 10 to 25 cm. long, or sometimes shorter, somewhat tapering above but not attenuate, more or less interrupted or lobed, sometimes rather open below, the branches usually short, the axis pubescent and often also villous with hairs 1 to 2 mm. long; bristles mostly single below each spikelet, 10 to 15 mm. long with shorter ones intermixed, flexuous, antrorsely scabrous; spikelets pale (the nerves usually pale), 2 to 2.5 mm. long, turgid on the convex side, sometimes strongly so at maturity; first glume about half as long as the spikelet, 3-nerved; second glume two-thirds to three-fourths as long as the spikelet, 5 to 7-nerved; sterile lemma as long as the fertile, 5-nerved, the palea narrow, a little shorter than the lemma; fertile lemma rather sharply but finely marked with cross-wrinkles.

The species is somewhat variable in habit and includes what Scribner and Merrill [1] and Hitchcock [2] referred to *Chaetochloa composita*. The typical form is rather robust

[1] U. S. Dept. Agr. Div. Agrost. Bull. **21**: 27. *f. 15*. 1900.

[2] Contr. U. S. Nat. Herb. **17**: 263. 1913.

with flat blades 5 to 10 mm. wide, and large panicles 15 to 25 cm. long, the branches ascending, about 1 cm. long, or even as much as 2 cm. The commoner form of Texas and northern Mexico is less robust, the blades narrower, 3 to 4 mm. wide, often folded, the panicles more compactly flowered and spikelike. There are so many intermediate specimens that it seems impracticable to draw specific lines between the forms.

Certain specimens approach *C. rariflora* in habit (such as, TEXAS: *Bush* 1252, *Rose* 18051, *Hitchcock* 5178, *Chandler* 7085), but differ in the glabrous (but scabrous) blades, pubescent but not pilose rachis, and pale spikelets (in *C. rariflora* the green nerves are prominent).

The following specimens have pubescent sheaths and blades: TEXAS: *Hitchcock* 5337, *Ball* 1527, *Groth* 123, *Jermy* 38. SONORA: *Rose* 13004. SAN LUIS POTOSÍ: *Hitchcock* 5729. NUEVO LEÓN: *Hitchcock* 5542, *Pringle* 1968.[1] The first glume is 5-nerved in *Rose* 10116.

A few specimens from Lower California have the aspect of typical *Chaetochloa macrostachya* but have slender spikelike panicles and glabrous sheath margins. The specimens, which are in a fragmentary condition, were described by Scribner and Merrill as *Chaetochloa rigida*, but the differences mentioned do not appear sufficient to indicate a distinct species. The specimens are: *Palmer* 125, 857; *Brandegee* in 1890; *Purpus* 227.

Chaetochloa macrostachya is closely related to *C. setosa*, but differs in having a more compact and much less tapering panicle. In *C. setosa* the panicle is attenuate at the summit.

DISTRIBUTION.

Open dry ground and dry woods, southwestern United States to Oaxaca.

TEXAS: Estelline, *Reverchon* 4262. Kingsville, *Piper* in 1906; *Tracy* 8882. Kinney County, *Hill* 83; *Mearns* 1216. San Antonio, *Hitchcock* 5132, 5162, 5178; *Bush* 1179, 1252; *Tweedy* in 1880. El Paso, *Hitchcock* 5337, 7825, 13320, 13426; *Chase* 5894, 5903; *Stearns* 179; *Rose* 17886. Chisos Mountains, *Bailey* 392. Corpus Christi, *Hitchcock* 5363; *Heller* 1480. New Braunfels, *Hitchcock* 5226. Laredo, *Hitchcock* 5508; *Mackenzie* 107; *Rose* 18051; *Havard* in 1884. Maravillas, *Havard* in 1883. Kent, *Tracy & Earle* 378. Del Rio, *Plank* 87; *Hitchcock* 13631. Big Spring, *Hitchcock* 13376, 13397. Robstown, *Hitchcock* 5388. Sarita, *Hitchcock* 5478. Rio Hondo, *Chandler* 7085. Bexar County, *Jermy* 38, 214. Bracken, *Groth* 123. Alpine, *Hitchcock* 13605. Uvalde, *Ball* 1527; *Reverchon* 1097 in 1885. Baylor County, *Reverchon* 1097 in 1879. Valverde County, *Nealley* 115. Western Texas, *Wright* 799, 800; *Havard* in 1881. Olmito, *Tracy* 8907. Bears Mountain, *Jermy* 783.

COLORADO: Canon City, *Eastwood* in 1892; *Jones* 780; *Shear* 979.

NEW MEXICO: Mangas Canyon, *Smith* in 1896. Mangas Springs, *Metcalfe* 154. Dona Ana Mountains, *Standley* in 1906. Organ Mountains, *Hitchcock* 3796. Mesilla Valley, *Standley* 407; *Hitchcock* 3818; *Wooton* 60. Las Cruces, *Vasey* in 1881; *Wooton* 1081. Deming, *Hitchcock* 3757. Rincon, *Jones* 4163. Grant County, *Rusby* 455. Roswell, *Griffiths* 5738. Cimarron Canyon, *Griffiths* 5554. Jarilla Junction, *Cockerell* 19. Aden, *Wooton* in 1906. Albuquerque, *Tracy* 85 in 1887. White Water, *Mearns* 2313. Carlsbad, *Hitchcock* 13489. Tortugas Mountain, *Standley* 6418. Black Range, *Metcalfe* 1147. Organ Mountains, *Vasey* in 1881; *Wooton* 438. Without locality, *Wright* 2094.

ARIZONA: Tucson, *Toumey* 805 and in 1894; *Griffiths* 1511, 3349, 3352; *Hitchcock* 3491; *Pringle* in 1884. Patagonia, *Hitchcock* 3659, 3660, 3678. Santa Rita

[1] This was referred to *Chaetochloa setosa* by Scribner and is the original of the figure so named (U. S. Dept. Agr. Div. Agrost. Bull. **21**: 39. *f. 24.* 1900).

Mountains, *Griffiths & Thornber* 194; *Griffiths* 3925, 5910, 5993. Oracle, *Hitchcock* 13266. Bisbee, *Mearns* 858, 926. St. Johns, *Griffiths* 5196. Beaver Creek, *Purpus* 8271. Pantano, *Pringle* in 1881. Benson, *Griffiths* 2003. San Bernardino Ranch, *Mearns* 746, 771, 781. Grand Canyon, *Leiberg* 5938. Fort Verde, *MacDougal* 539. Gila Valley, *Rothrock* 334. Fort Huachuca, *Wilcox* in 1894. Pearse, *Griffiths* 1944. Without locality, *Palmer* in 1869.

LOWER CALIFORNIA: Ensenada, *Orcutt* in 1889. San Pablo Canyon, *Purpus* 227. Carmen Island, *Palmer* 857 in 1890. La Paz, *Palmer* 125 in 1890. San José del Cabo, *Brandegee* in 1890. Magdalena Bay, *Brandegee* 28 in 1889.

SONORA: Hermosillo, *Hitchcock* 3590. Alamos, *Rose* 13004. Guaymas, *Palmer* 53 and 340 in 1887.

CHIHUAHUA: San Luis Mountains, *Mearns* 2101. Casas Grandes, *Nelson* 6368. Chihuahua, *Hitchcock* 7775; *Pringle* 488.

COAHUILA: Saltillo, *Palmer* 378 in 1898; *Hitchcock* 5589, 5604, 5634. Sabinas, *Nelson* 6820. Torreón, *Palmer* 505 in 1898.

NUEVO LEÓN: Monterrey, *Hitchcock* 5534, 5542; *Pringle* 1968.

SAN LUIS POTOSÍ: San Luis Potosí, *Hitchcock* 5665. Cárdenas, *Hitchcock* 5729.

ZACATECAS: Concepción del Oro, *Palmer* 261 in 1904. Zacatecas, *Hitchcock* 7521.

DURANGO: Tlahualilo, *Pittier* 471. Torreón, *Hitchcock* 7728. Durango, *Hitchcock* 7623; *Palmer* 378 and 872 in 1896.

TEPIC: San Blas, *Nelson* 4341.

QUERÉTARO: Querétaro, *Hitchcock* 5808.

HIDALGO: Ixmiquilpan, *Rose* 8993.

VERACRUZ: Mirador, *Liebmann* 362.

PUEBLA: Tehuacán, *Rose* 10116; *Hitchcock* 6047.

OAXACA: Oaxaca, *Hitchcock* 6068. Tomellín, *Hitchcock* 6241.

26. **Chaetochloa scheelei** (Steud.) Hitchc.

Setaria polystachya Scheele, Linnaea **22:** 339. 1849. Not *Setaria polystachya* Schrad. 1824. "Auf felsigen Boden nördlich von Neubraunfels: Lindheimer." The type collection is Lindheimer's no. 564 of fascicle III, Flora Texana Exsiccata,[1] collected in 1846. A specimen of this collection is in the National Herbarium. The culm is 1.2 meters tall, the sheaths minutely scaberulous, the blades flat, scabrous, 10 to 13 mm. wide; the panicle is rather loose, 22 cm. long, the axis villous.

Panicum scheelei Steud. Syn. Pl. Glum. **1:** 51. 1854. Based on *Setaria polystachya* Scheele, not *Panicum polystachyum* Presl. Steudel spells the name "*scheelii.*"

Chaetochloa polystachya Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. **21:** 37. *f. 22.* 1900. Based on *Setaria polystachya* Scheele.

DESCRIPTION.

Plants perennial; culms 60 to 120 cm. tall, erect or geniculate at base, compressed below, glabrous, the nodes often appressed-pilose; sheaths compressed-keeled, glabrous, or scabrous near summit or on the keel, or sometimes more or less hispid on the surface, the collar hispid; ligule densely hispid, 1 to 2 mm. long; blades flat, scabrous or more or less pubescent, 15 to 25 cm. long, as much as 1.5 cm. wide; panicle rather loose, 15 to 20 cm. long, tapering from near the base, the lower branches as much as 3 cm. long, ascending, the axis scabrous-pubescent and rather sparsely villous; bristles mostly 1 to 1.5 cm. long, rather numerous, flexuous, antrorsely scabrous; spikelets a little more than 2 mm. long, pale; first glume about one-third as long as the spikelet, 3-nerved; second glume a little shorter than the fertile lemma, 5-nerved; sterile lemma as long as the fertile, 5-nerved, the palea small and narrow; fertile lemma finely cross-wrinkled.

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[1] See Rep. Mo. Bot. Gard. **18:** 151. 1907.

This species is allied to *C. macrostachya*, from which it differs in the looser panicle with longer ascending lower branches. The broad flat blades distinguish it from the common form of *C. macrostachya* in Texas. A specimen (*Müller* 2051, in N. Y. Bot. Gard. Herb.) from Orizaba, Mexico, appears to be this species.

FIG. 62.— *Chaetochloa scheelei*. From *Bush* 1244, Texas.

DISTRIBUTION.

Open or rocky woods, southern Texas.

TEXAS: Burnet, *Plank* 4. Kerrville, *Smith* in 1897; *Hitchcock* 5299. San Antonio, *Bush* 1200, 1244; *Hitchcock* in 1903; *Hitchcock* 5245. Mouth of Pecos River, *Havard* 34 in 1883. Austin, *McAllister & Tharp* in 1914; *Biltmore Herb* 14922b. Brownsville, *Hitchcock* in 1904. Kingsville, *Piper* in 1906. Abilene, *Bentley* in 1899. New Braunfels, *Lindheimer* 564; *Hitchcock* 5203, 5237. Comanche Spring, *Lindheimer* 1251. On the San Marcos, *Wright*. Sabinal Canyon, *Reverchon* 1623. Bexar County, Jermy 783. Without locality, *Nealley* in 1888.

DOUBTFUL SPECIES.

SETARIA FALCIFOLIA Fourn. Mex. Pl. **2**: 44. 1886. "Culmo recto, stramineo, oliato, e radice fibrosa orto; foliis longis, falciformibus, angustis, plicatis, acutis, cum vaginis villosis, ligula laciniato-pilosa; thyrso lineari, fasciculis remotis, paucifloris; chaetocladis scabrioribus parvis, paucis versus basim fasciculi; gluma inferiore minore quam dimidia spicula; superiore 2/3 floris aequante; flore hermaphrodito tenuiter striato. Absque loco (JURG. n. 622)."

NOTE ON SETARIA ACH.—Stapf[1] discusses the validity of the names *Setaria* Ach. and *Chaetochloa* Scribn. He shows that *Setaria* was used by Acharius as a subdivision of the genus *Lichen* and not as a distinct genus. The author of the present revision of *Chaetochloa* regards the genus *Setaria* as effectively published by Michaux, since it was based on the section or tribe of Acharius, therefore invalidating *Setaria* Beauv. Stapf rejects *Setaria* Ach. because it has not come into general use, and accepts *Setaria* Beauv. as valid.

[1] Kew Bull. Misc. Inf. **1920**: 124. 1920.

INDEX.

[Synonyms in italic. Page numbers of principal entries in heavy-face type.]

Page.

Agrostis *flabellata* 160
rigidifolia 118
Alopecurus *monspeliensis* 179
paniceus 179
Barnyard grass 142
Berchtoldia holciformis 137
oplismenoides 136
Billion dollar grass 133, **146**
Capim de Angola 135
Cenchrus *parviflorus* 168, 169, 171, **179**
Chaetochloa **155**, 156
ambigua **186**
barbata **158**, 159
breviseta 179
caudata 198, 199
composita 202, 203, 205
corrugata 171, **191**, 192
parviflora 171, 192
flava 171
geniculata 166, **168**, 169, 171, 172, 192
gibbosa 204
glauca 165
perennis 171
gracilis 171
grisebachii **183**, 184
ampla 183
mexicana 183
hispida 192
imberbis 169, 171
geniculata 171
perennis 171
streptobotrys 171
impressa 177
italica 155, **189**, 190
laevigata 171
latifolia **194**, 195
breviseta 194
leucopila 205
liebmanni **193**
pauciflora 193
longipila **191**
lutescens 155, **165**, 167
macrosperma **195**, 196, 203
macrostachya 177, **204**, 205, 206, 208
magna **185**, 203
occidentalis 171
onurus 177
palmifolia **161**, 162, 163
penicillata 171
perennis 171
polystachya 207
poiretiana **159**, 160
purpurascens 171

Page.

Chaetochloa rariflora 198, **200**, 201, 206
rigida 205, 206
salzmanniana 176
scandens **180**, 181, 182
scheelei **207**, 208
setosa 164, **198**, 199, 201, 204, 206
sulcata 160, **162**, 163, 164
tenacissima 182
tenax **176**, 177, 204
ventenatii 171
versicolor 171
verticillata **178**, 179, 186
villosissima **197**
viridis 155, 166, 186, **187**, 190
vulpiseta 177, **202**, 203, 204
Chamaeraphis 156
caudata 199
pauciflora 193
composita 203
corrugata 192
costata 158
crus-ardeae 160
effusa 163
glauca 165
geniculata 170
imberbis 170
laevigata 170
penicillata 170
perennis 170
gracilis 171
imberbis 171
italica 190
ambigua 186
verticillata 178
viridis 187
juergensii 160
jurgensenii 160
macrostachya 205
magna 185
palmifolia 161
paniculifera 163
penicillata 171
setosa 199
caudata 199
macrostachya 204
vulpiseta 203
speciosa 160
sulcata 163
ventenatii 170
verticillata 178
viridis 187
Cynosurus *paniceus* 178, 179

Page.
Echinochloa 123, **133**
colonum 133, **150**, 151
zonalis 151
Echinochloa *composita* 148
crusgalli 133, **139**, 140, 141, 142
aristata 140
crus-pavonis **148**, 149
edulis 133, **146**
frumentacea 146
mitis 142, **144**, 145, 147
zelayensis 144, **147**
cubensis 129
frumentacea 146
holciformis **137**
longiaristata 138
muricata 140
oplismenoides **136**
polystachya **135**
pyramidalis **134**
sabulicola 149
spectabilis 135
walteri **138**, 140
zelayensis 147
Foxtail, green 155
yellow 155
Gamalote 161, 163
Hekaterosachne 123
elatior 123
Hippagrostis 123
Hoplismenus 123
Hungarian grass 155
Isachne **115**
angustifolia 118, **119**
arundinacea **119**, 120, 121
australis 115
disperma **120**, 121
dubia 121
leersioides **117**
panicea 119
polygonoides 115, **116**, 117
pygmaea **117**
rigens 117, **118**, 119
rigidifolia **118**
trachysperma 116
Ixophorus 156
glaucus 165
italicus 190
verticillatus 178
viridis 187
Japanese barnyard millet 133, **146**
Milium *colonum* 150
crusgalli 140
rigidifolium 118
rigidum 118
undulatifolium 129
Millet 155
Japanese barnyard 133, **146**
pearl 165
Oplismenus 123
affinis 124, 125
africanus 123, 124
albus 124
angustifolius 149
brasiliensis 124
bromoides 124
burmanni **124**, 125

Page.
Oplismenus *chondrosioides* 129
colonus 150
compositus 130
cristatus 125
crusgalli 140
crus-pavonis 142, 148, 149
cubensis 129
depauperatus 132
echinatus 153
frumentaceus 146
hirtellus **129**, 130
hirtiflorus 131
humboldtianus 124
muticus 125
jamaicensis 149
latifolius 131
liebmanni 131
loliaceus 132
longisetus 138
muricatus 140
parvifolius 127
polystachya 135
rariflorus **131**, 132
repens 150
setarius **126**, 127, 128, 129
thiebauti 132
velutinus 129
zelayensis 142, 147
Orthopogon 123
africanus 124
bromoides 125
burmanni 124
compositus 123
crusgalli 140
cubensis 129
hirsutus 135
hirtellum 127, 129
hispidus 138
holciformis 137
parvifolium 127, 129
setarius 127
Palm grass 155
Panicum 123, 133, 155, 156
africanum 124
album 124
ambiguum 186
amphibolum 176
amplifolium 203
aristatum 149
arundinaceum 119
barbatum 158
berteronianum 170
bonplandianum 135
brachiatum 198, 200
bromoides 124, 125
burmanni 123, 124
caudatum 183, 198, 199, 200, 201, 204
colonum 150
zonale 151
compositum 123, 124, 202
compressum 165
confertum 120
corrugatum 191, 192
costatum 158
crus ardeae 160
cruscorvi 140

Page.

Panicum *crusgalli* 139, 140, 142, 147, 149
aristatum 142
breviaristatum 142
hispidum 138
longiaristatum 142
mite 142, 144
muticum 144
purpureum 144
sabulicola 149
crus-pavonis 148
crus-pici 147
cubense 129
dasyurum 169, 170
dispermum 119, 120, 121
dissitiflorum 193
dumetorum 198
echinatum 153
elongatum 159
flabellatum 160
flavescens 158
flavum 169, 171
francoi 125
frumentaceum 142, 146
fuscescens 169
geniculatum 168, 170, 171
germanicum 189, 190
glaberrimum 168, 171
glaucescens 119, 170
glaucum 165, 168, 170, 187
flavescens 165
purpurascens 169
gracile 170
grossum 140
helvolum 178
hirtellum 123, 124, 127, 129, 138
hispidum 138
holciforme 137
horridum 149
imberbe 168, 169, 170, 171
dasyurum 170
latifolium 170
pumilum 169
purpurascens 170
impressum 176, 177
incertum 150
intermedium 176
italicum 185, 189, 190, 202
germanicum 190
viride 187
jamaicense 149
jurgensenii 160
laevigatum 168, 169, 170
lappaceum 124
loliaceum 131
longisetum 138
lutescens 165
macrostachyum 202, 203, 204
macrourum 202
mexicanum 163
multinerve 120
muricatum 140, 153
nuttallianum 127
occidentale 171
onurus 177, 204
palmaefolium 161
palmifolium 155, 161

Page.

Panicum *paniculiferum* 133
paractaenoides 198, 199
parciflorum 131
penicillatum 169, 170, 171
phyllanthum 135
plicatum 156, 161
haitiense 161
poiretianum 159
polygonoides 116
polystachyum 207
prorepens 150
psilocaulon 170
pumilum 168, 169
pungens 140
purpurascens 169, 170
pyramidale 134
raddianum 125
rariflorum 193
restitutum 198
rigens 118
rigidifolium 118
sabulicolum 148, 149
sanctae-marthae 125
scandens 181
longiseta 181
vulgare 181
scheelei 207
schultesii 125
scindens 144
setarium 126
setosum 198, 199, 204
speciosum 160
spectabile 135
guadaloupense 134
sphaerocarpon 176
sphaerocarpum 176, 177
subsphaerocarpum 203
sulcatum 159, 160, 162, 163
tejucense 169
tenacissimum 182
tenax 176
trachyspermum 116
trinii 182
undulatifolium 129
velutinum 129
ventenatii 169
versicolor 171
verticillatum 178, 179
ambiguum 186
parviflorum 179
viaticum 158
virescens 170
viride 156, 165, 178, 179, 187
brevisetum 187
vulpisetum 202, 203
walteri 138
zelayense 147
zonale 150
Paurochaetium (subgenus of Panicum) 155
Pearl millet 165
Penicillaria spicata 165
Pennisetum *americanum* 165
corrugatum 191
geniculatum 168
glaucum 165
italicum 190

Page.

Pennisetum *laevigatum* 169
scandens 180
setosum 199
swartzii 199
typhoideum 165
verticillatum 178, 187
viride 187
Pigeon grass 155
Polypogon monspeliensis 179
Ptychophyllum (subgenus of Chaetochloa) 155, 156, **158**
Ptychophyllum (subgenus of Panicum) 156, 160
Setaria, Ach., note on 208
affinis 169
alopecurus 202
ambigua 186
berteroniana 169, 170
biconvexa 176
brachiata 198, 199
caespitosa 177
californica 190
caudata 198
composita 195, 202, 203
corrugata 169, 191, 192
crus ardeae 160
effusa 163
elongata 198
falcifolia 208
flava 169
geniculata 168
glauca 155, 165, 168
geniculata 171
imberbis 170
laevigata 170
penicillata 170
perennis 170
purpurascens 171
gracilis 168, 170, 171
dasyurum 170
latifolia 170
purpurascens 170
hispida 192
imberbis 169

Page.

Setaria *impressa* 160
italica 155, 197
jurgensenii 160
laevigata 169
laevis 183
latifolia 194
liebmanni 193
longipila 191
macrosperma 195
macrostachya 203, 204, 205
magna 185
mexicana 183
onurus 177
palmifolia 161
panicea 178, 179
paniculifera 163
paractaenoides 199
penicillata 169, 171
perennis 170, 171
poiretiana 160
polystachya 202, 207
purpurascens 168, 171
pseudoverticillata 178
rariflora 193, 200, 201
scandens 180
setosa 183, 198
caudata 183, 199
sphaerocarpa 177
streptobotrys 170, 171
sulcata 163
tejucensis 169
tenacissima 182
tenax 176
vaginata 200
ventenatii 168, 169, 170, 171
verticillata 178, 179
ambigua 186
villosissima 197
viridis 156, 168, 179, 187
breviseta 187
weinmanni 187
vulpiseta 202
weinmanni 187

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THE NORTH AMERICAN SPECIES OF PENNISETUM

By AGNES CHASE

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PREFACE

The paper presented herewith, by Mrs. Agnes Chase, assistant agrostologist of the United States Department of Agriculture, is a revision of one of the important genera of grasses. The method of study and presentation is the same as that followed in earlier papers on North American grasses, which have been published in the Contributions.

The genus *Pennisetum* belongs chiefly to the Old World, Africa being especially rich in number of species. In North America we have 10 species which are native and 4, including the well-known pearl millet, which are now established from earlier introductions, besides a few species cultivated for ornament, and one promising forage grass which is now being introduced into the Southern States.

The native North American species have been much confused with each other and with closely related South American species. They are confined chiefly to the tropics and subtropics, only one native species extending into the southern United States.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

CONTENTS.

	Page.
Introduction	209
Description of the genus and species	210
Excluded species	234
Index	IX

ILLUSTRATIONS.

TEXT FIGURES.

		Page.
FIGURE 63.	*Pennisetum villosum*	213
64.	*Pennisetum orientale triflorum*	215
65.	*Pennisetum ciliare*	215
66.	*Pennisetum glaucum*	217
67.	*Pennisetum karwinskyi*	220
68.	*Pennisetum setosum*	223
69.	*Pennisetum antillarum*	225
70.	*Pennisetum crinitum*	226
71.	*Pennisetum complanatum*	227
72.	*Pennisetum domingense*	228
73.	*Pennisetum durum*	229
74.	*Pennisetum distachyum*	230
75.	*Pennisetum prolificum*	231
76.	*Pennisetum bambusiforme*	233

THE NORTH AMERICAN SPECIES OF PENNISETUM.

By Agnes Chase.

INTRODUCTION.

The genus *Pennisetum* is one of that series of *Paniceae* in which sterile branches of the inflorescence are modified into an involucre subtending or surrounding the spikelets. This series falls into two groups, one in which these reduced branches or bristles remain on the common axis, the spikelets falling alone, the other in which the one or more free or coalesced bristles fall with the spikelets inclosed and aid more or less in the dispersal of the seed. The first group contains *Chaetochloa* and its allies, the second *Chamaeraphis*, *Paratheria*, *Pennisetum*, *Plagiosetum*, *Odontelytrum*, and *Cenchrus*. The second group is but poorly represented in the Western Hemisphere. Only the monotypic genus *Paratheria* Griseb., about 20 species of *Pennisetum*, and 15 of *Cenchrus* are native to America.

One species of the genus, *Pennisetum glaucum*, pearl millet, has been cultivated since before the dawn of history and is unknown in the wild state. Its grain forms an important article of food in Africa and to a less extent in India. In our Southern States pearl millet is grown for forage. Another African species, *Pennisetum purpureum* Schumach., is being introduced as a fodder plant in the South under the name Napier grass. *Pennisetum ruppelii* Steud. and *P. macrostachyum* (Brongn.) Trin., with beautiful feathery panicles, are cultivated for ornament.

The American species of *Pennisetum* have been much confused. A recent work on the derivation of pearl millet,[1] by Paul Leeke, is devoted in part to the other species of the genus. A key to all the species is given and the numerous synonyms are referred to the species and varieties recognized. Except in the series *Penicillaria*, which includes "Negerhirse" (*Pennisetum glaucum*), no descriptions are given, save in new species and new varieties, and in a few other instances, and no specimens are cited. The American species were not well understood by Dr. Leeke, as shown by his referring the American *P. setosum* and the very different *P. multiflorum* Fourn., both perennials, to the East Indian annual, which he calls *P. indicum* [*P. polystachyum* (L.) Schult.].

[1] Untersuchungen über Abstammung und Heimat der Negerhirse [*Pennisetum americanum* (L.) Schum.] von Dr. Paul Leeke. Zeitschr. Naturw. **79**: 1–108, with plates. 1907.

Pennisetum has been divided into various subgenera which appear to be fairly natural groups. Among our few species, however, are some that are intermediate or exceptional. *Pennisetum setosum*, with its densely plumose bristles, comes under subgenus *Eriochaeta*, but the obviously related *P. antillarum* has bristles not at all plumose. The introduced species belong in *Pennisetum* proper, with ciliate bristles and more than one spikelet in a fascicle. *Pennisetum karwinskyi* falls in this group, though in this the bristles are sometimes scarcely ciliate. The rest of our species, with bristles scabrous only, belong in subgenus *Gymnothrix*. The section *Beckeropsis* of the subgenus *Gymnothrix* is not represented in America, though the South American *P. exaltatum* and *P. mutilatum*, with few and reduced bristles, approach it. *Pennisetum glaucum* is placed in section *Penicillaria* by Stapf[2] and by Leeke. The name *Penicillaria* refers to the minute brush of hairs at the tips of the anthers in this species.

An adequate revision of *Pennisetum* as a whole can be prepared only by someone having access to abundant material from Africa, its center of distribution. The present paper deals only with the species found in North America, 10 native and 4 introduced.

The text figures illustrate part of the inflorescence, two-thirds natural size.

DESCRIPTION OF THE GENUS AND SPECIES.

PENNISETUM L. Rich.

Pennisetum L. Rich. in Pers. Syn. Pl. 1: 72. 1805. Five species, *P. typhoideum*, *P. setosum*, *P. cenchroides*, *P. orientale*, and *P. violaceum* are included. All belong to the genus as at present limited. The first (which is the same as *P. glaucum*), agreeing with the generic characters given and being an important economic species, is taken as the type. The generic name refers to the plumose bristles, a character more pronounced in the other species included than in the type.

Penicillaria Willd. Enum. Pl. 1036. 1809. *Penicillaria spicata* Willd., based on *Holcus spicatus* L. (which is the same as *Pennisetum glaucum*), is taken as the type. In a footnote Willdenow explains that the genus was characterized by Swartz in Schrader's Neues Journal. The article referred to is one in which Swartz [3] discusses the genus *Holcus* and shows that *H. spicatus* L. does not belong in that genus, but rather in *Cenchrus* or in a distinct genus. He then gives a detailed description from a specimen grown in his garden, but does not propose a generic name. A second species, *P. ciliata*, based on *Alopecurus indicus* (*Pennisetum indicum* (Murray) Kuntze) is added. The name doubtless refers to the penicillate tips of the anthers, but neither Swartz nor Willdenow mentions this character.

Gymnothrix Beauv. Ess. Agrost. 59. *pl. 13. f. 6*. 1812. A single species, *G. thuarii* Beauv., from Ile-de-France [Mauritius] is included. The figure shows a fascicle with bristles not plumose. Beauvois divides *Pennisetum* into three genera: *Penicillaria*, containing the species with penicillate anthers ("apici villosis"); *Pennisetum*,

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[2] In Thiselt. Dyer, Fl. Cap. 7: 431. 1898.

[3] Neu. Journ. Bot. Schrad. 2: 39–49. 1807.

containing the species with plumose bristles and 3 to 5 spikelets in a fascicle (among the species listed is *P. setosum* with solitary spikelets); and *Gymnotrix*, with glabrous bristles and solitary spikelets.

Catatherophora Steud. Flora **12**: 465. 1829. A single species, *C. hordeiformis*, based on *Panicum hordeiforme* Thunb., is included. Steudel segregates it from *Gymnothrix* because the lower florets are undeveloped, that is, the sterile palea is wanting. *Panicum hordeiforme* Thunb. is composed of three varieties, α and β being from the Cape of Good Hope, and γ from Japan. Steudel cites Ecklon's no. 973 from South Africa, showing that it is the African form upon which he bases his genus. This is *Pennisetum hordeiforme* (Thunb.) Spreng. In Steudel's Nomenclator [4] the name is spelled *Catateropho*ra.

Pentastachya Hochst.; Steud. Nom. Bot. ed. 2. **2**: 299. 1841. No description is given. A single species, *P. abyssinica* Hochst., nom. nud., is mentioned, this based on *Pennisetum pentastachyum* Hochst., not described until 1851. Here Richard [5] states that Hochstetter wished to propose the genus *Pentastachya* for this species, but that it could not be distinguished generically from other species having several spikelets in a fascicle.

Beckeropsis Fig. & DeNot. Agrost. Aegypt. Frag. **2**: 49. *pl. 28*. 1853. (Mem. Accad. Sci. Torino **14**: 365. 1854). Two species, *B. nubica*, based on *Beckera nubica* Hochst., and *B. petiolaris*, based on *Beckera petiolaris* Hochst., are included. The first is illustrated and is taken as the type. In this species the fascicle is reduced to a single long bristle below the solitary spikelet.

Eriochaeta Fig. & DeNot. Agrost. Aegypt. Frag. **2**: 58. *pl. 30*, *31*, *32*. 1853. (Mem. Accad. Sci. Torino **14**: 374. 1854). Three species, *E. secundiflora*, *E. densiflora*, and *E. reversa* are included. Each is illustrated. In these species the bristles are conspicuously plumose, and the spikelets are on plumose pedicels.

Sericura Hassk. in Steud. Syn. Pl. Glum. **1**: 404. 1854. A single species, *S. elegans* Hassk., from Java, is included. Leeke [6] refers this to *Pennisetum macrostachyum* (Brongn.) Trin. The description well applies to that species. The name *Sericura* was listed, with a few words of misleading description, in 1842.[7] Steudel obviously misunderstood this genus. Though the generic description applies perfectly to *Pennisetum*, he places it in *Andropogoneae* next to *Imperata*.

Macrochaeta Steud. in Zoll. Syst. Verz. Ind. Arch. Pfl. 60. 1854. The name *Macrochaeta sacchariformis* is mentioned without description in a note appended to *Sericura*. Steudel (see paragraph above) says that he had formerly used the name in letters.

Amphochaeta Anderss. Svensk. Vet. Akad. Handl. **1853**: 136. 1855. A single species, *A. exaltata* Anderss., from the Galápagos Islands, is included. In this the bristles are reduced to 2 to 6, mostly shorter than the spikelet and more or less clustered at each side of it. Andersson emphasizes this character (hence the name).

DESCRIPTION.

Spikelets sessile or short-pediceled, one to several together, surrounded or subtended by an involucre, composed of a fascicle of reduced sterile branchlets, the fascicles sessile or short-peduncled and usually crowded on a common axis forming spike-like panicles, the fascicles falling entire with the spikelet inclosed; fascicles with few to numerous slender, antrorsely scabrous bristles, distinct throughout or, in two species, united at the very base into a minute disk, the outermost short, the inner longer, mostly unequal, the innermost (that is, the branchlet at the base of which the spikelet or the uppermost spikelet is borne) often stouter and longer than the others, sometimes conspicuously so; spikelets lanceolate, mostly acute; glumes unequal, 1 to 5-nerved,

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[4] Nom. Bot. ed. 2. **1**: 311. 1840.
[5] Tent. Fl. Abyss. **2**: 387. 1851.
[6] Zeitschr. Naturw. **79**: 41. 1907.
[7] Hassk. Flora **25**[2]: Beibl. 2. 1842.

the first usually minute, rarely obsolete; sterile lemma few to several-nerved, inclosing a palea and often a staminate flower or empty; fruit subindurate, smooth, the lemma acuminate, mostly nerved toward the summit, its margins thin and usually flat; the palea of similar texture or a little thinner, its tip sometimes acuminate and free from the clasping lemma; stamens 3; stigmas plumose; grain usually oblong, dorsally compressed, with a punctiform hilum, free within the lemma and palea.

Annuals or perennials, mostly tall and robust, confined to the tropics and subtropics. There are probably 80 species or more, over half of them confined to Africa.

The spikelet of *Pennisetum glaucum*, presumably developed under cultivation, has assumed a form somewhat analogous to that of Indian corn. The fascicles are persistent on the axis, the glumes are much reduced, and the enlarged grain at maturity protrudes from the lemma and palea.

The simplest form of *Pennisetum* is found in the African species of the section *Beckeropsis*, in which there is a single bristle below the spikelet. In the South American *P. mutilatum* (Kuntze) Hack. the single bristle is usually shorter than the spikelet, or is sometimes obsolete. *Pennisetum exaltatum* (Anderss.) Leeke, of the Galápagos, connects these one-bristled forms with such few-bristled species as the North American *Pennisetum durum*. In *Hymenachne montana* Griseb., of Argentina, is found what suggests an approach to *Pennisetum*. In that the lower spikelets of the panicle are sometimes subtended by a bristle. The uppermost spikelet also is often thus subtended; that is, the spikelet-bearing branchlet is prolonged into a scabrous bristle. The subindurate fertile lemma and palea and the lanceolate spikelets of *Pennisetum* also suggest relationship to *Hymenachne*. At the other extreme, such species of *Pennisetum* as *P. karwinskyi* and *P. ciliare*, with bristles united at the very base and with several spikelets in a fascicle, approach such species of *Cenchrus* as *C. myosuroides*.

KEY TO THE SPECIES.

Bristles about 4 cm. long; panicles oval, feathery; spikelets 10 to 12 mm. long.
1. P. villosum.

Bristles rarely over 2 cm. long, most of them much shorter; panicles cylindric or nearly so; spikelets not over 7 mm. long.

Grain at maturity subglobose, bursting through the lemma and palea; panicle solidly dense, 2 cm. or more thick; plants annual.....**4. P. glaucum.**

Grain permanently inclosed in the lemma and palea; panicles less than 2 cm. thick, not solid; plants perennial.

Fascicles, or most of them, with 2 or more spikelets.

Bristles free throughout, some of them plumose. Fascicles pedunculate; spikelets pedicellate.....**2. P. orientale triflorum.**

Bristles united at the base into a minute disk.

Inner bristles conspicuously plumose, much exceeding the spikelets.
3. P. ciliare.

Inner bristles sparsely (rarely not at all) ciliate, only the innermost much exceeding the spikelets.....**5. P. karwinskyi.**

Fascicles with but one spikelet.

Bristles conspicuously plumose.....**6. P. setosum.**

Bristles not plumose.

Panicles terminal on the primary culm and leafy branches only.

Blades involute, not over 5 cm. long.....**10. P. domingense.**

Blades flat or involute-pointed only, 10 cm. or more long.

Spikelets 2 to 2.5 mm. long; axis about 0.5 mm. thick.**7. P. antillarum.**

Spikelets 4.5 mm. or more long; axis 1 to 3 mm. thick.

Bristles scant, most of them scarcely exceeding the spikelets or shorter; panicle stiff, densely flowered.....**8. P. crinitum.**

Bristles numerous, most of them about twice the length of the spikelet; panicle less dense.....**9. P. complanatum.**

Panicles terminal and axillary, the latter on slender naked peduncles, 1 to several from a sheath.

Blades elongate, rarely over 12 mm. wide, tapering into a long setaceous-involute tip; spikelets 6 to 7 mm. long, the bristles mostly shorter. **11. P. durum.**

Blades 15 to 40 mm. wide, if narrower not elongate, not setaceous-tipped; spikelets 4.5 to 6 mm. long, some of the bristles always longer.

Sterile lemma inclosing a well-developed palea and usually a staminate flower; panicles loosely flowered; most of the bristles about twice the length of the spikelet.....**14. P. bambusiforme.**

Sterile lemma empty; panicles rather densely flowered; most of the bristles not more than once and a half the length of the spikelets.

Panicles dull green; bristles scant, most of them not exceeding the spikelet, the innermost about twice as long. **12. P. distachyum.**

Panicles tawny; bristles numerous, most of them exceeding the spikelet, the innermost not conspicuously longer than the others. **13. P. prolificum.**

1. Pennisetum villosum R. Br.

Pennisetum villosum R. Br. in Salt, Voy. Abyss. App. 62. 1814, nom. nud.; in Fres. Mus. Senckenb. Abh. **2**: 134. 1837. Described from specimens collected in Abyssinia during the years 1805 to 1810 by Henry Salt. The type has not been examined.

Pennisetum villosum var. *humile* Hochst.; A. Rich. Tent. Fl. Abyss. **2**: 387. 1851. "Prope Adoua [Abyssinia] (Schimper)." A specimen of Schimper's no. 316, collected at Adoa, Abyssinia, in September, 1837, in the National Herbarium, is a dwarfed plant like Chase's no. 5600 from Santa Barbara, California.

Cenchrus villosus Kuntze, Rev. Gen. Pl. **3**^{2}: 347. 1898. Based on *Pennisetum villosum* R. Br.

DESCRIPTION.

Plants perennial, rather pale, at length forming dense clumps from a knotted crown; culms ascending, 15 to 50 cm. tall, rarely 1 meter or more tall, commonly branching from the lower nodes, mostly flattened or angled in drying, the uppermost joint villous, at least below the inflorescence, otherwise glabrous; sheaths loose, mostly overlapping, pilose along the scarious margin and at the summit or glabrous; ligule a ring of fine hairs 1.5 to 2 mm. long; blades ascending or spreading, 3 to 6 mm. wide, mostly elongate, the upper often exceeding the inflorescence, but in dwarf plants sometimes only 8 to 10 cm. long, flat or folded, sparsely pilose on the upper surface or glabrous, the margins and sometimes the under surface scabrous; panicle grayish tawny, very dense, oval, 3 to 15 cm. long, 3 to 5 cm. wide including the bristles; fascicles short-peduncled, with a tuft of white hairs at the base of the peduncles; bristles slender, spreading, the longest 4 to 5 cm. long, the inner plumose below, the innermost not differentiated from the others; spikelets 1 to 4 in a fascicle, sessile, 10 to 12 mm. long, 1.7 to 2 mm. wide; glumes unequal, the first about 1 mm. long, one-nerved or nerveless, subacute, the second about one-third the length of the spikelet, one-nerved, acuminate; sterile lemma slightly shorter than the fertile one, long-acuminate, finely many-nerved, scabrous

FIG. 63.—*Pennisetum villosum*. From *Eastwood* 172, California.

except at the base, inclosing a well-developed palea and often a staminate flower; fruit but little indurate, long-acuminate, the lemma finely nerved and scabrous on the upper half, the margins thin and flat, the long brownish styles more or less persistent or caught in the feathery bristles.

This species is cultivated for ornament. In the trade it is commonly called *Pennisetum longistylum*. According to Hackel [8] and Leeke [9] this is not *P. longistylum* Hochst.[10] A specimen of the type collection of the latter, Schimper's no. 65, from Adoa, Abyssinia, in the National Herbarium, is very immature. It is much like dwarfed plants of *P. villosum*. The bristles are less plumose than are those of that species. It is clearly allied to *P. villosum* and does not belong in the section *Gymnothrix*, as stated by Hackel. Leeke places it next to *P. villosum*, differentiating it by the greater number of nerves in the sterile lemma.

DISTRIBUTION.

Arid open ground, East Africa; sparingly escaped from cultivation in the United States, Mexico, and Jamaica.

MICHIGAN: Port Huron, *Dodge* 126.

TEXAS: Texarkana, *Plank* 23.

CALIFORNIA: Santa Barbara, *Eastwood* 172; *Chase* 5600; *Somes* C17. Ventura, *Parish* 11049.

SINALOA: Topolobampo, *Palmer* 231 in 1897.

JAMAICA: St. Andrew, *Harris* 12402.

PENNISETUM RUPPELII Steud.,[11] commonly called fountain-grass, is cultivated in parks and borders. It is a tufted perennial about 1 meter tall, with simple culms, narrow elongate scabrous blades, and beautiful feathery, purple or pinkish, nodding panicles, 15 to 35 cm. long, the fascicles pedunculate, not crowded, with one to three short-pediceled spikelets, the bristles plumose toward the base, the longest 3 to 4 cm. long. *Pennisetum macrostachyum* (Brongn.) Trin.,[12] with broad blades and larger panicles with longer, more silky, not plumose bristles, is cultivated sparingly. A purple strain of this has been called "*P. macrophyllum atropurpureum*" [13] by seedsmen.

2. Pennisetum orientale triflorum (Nees) Stapf.

Pennisetum triflorum Nees in Steud. Syn. Pl. Glum. **1**: 107. 1854. "(* * * *Royle* Hrbr. nr. 59.) Nepal." The type has not been examined, but the description well applies to the East Indian plants identified as *P. orientale* var. *triflorum* by Stapf.

Pennisetum orientale var. *triflorum* Stapf in Hook. f. Fl. Brit. Ind. **7**: 86. 1896. Based on *Pennisetum triflorum* Nees.

DESCRIPTION.

Plants perennial, forming tough clumps from knotted crowns; culms erect from an ascending base, usually 1 meter or more tall, rather robust, simple or sparingly branching, pubescent or scabrous below the panicle, otherwise glabrous; nodes

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[8] In Engl. & Prantl, Pflanzenfam. **2**[2]: 38. 1887.

[9] Zeitschr. Naturw. **79**: 23. 1907.

[10] A. Rich. Tent. Fl. Abyss. **2**: 338. 1851.

[11] Nom. Bot. ed. 2. **2**: 298. 1841, nom. nud.; Syn. Pl. Glum. **1**: 107. 1854. "*P. macrostachyum* Fresen. Hochst. hrb. un. it. Abyss. no. 72." Described from Abyssinia.

[12] Mém. Acad. St. Pétersb. VI. **3**[2]: 177. 1834. Originally described from the Moluccas.

[13] Henkel in Möllers Deutsch. Gärt. Zeit. **1906**: 9. 1906.

appressed-pubescent, leaves numerous, the sheaths loose, mostly overlapping, ciliate on the margin, otherwise glabrous; ligule lacerate-ciliate, scarcely 1 mm. long; blades flat, lax, 5 to 10 mm. wide, elongate, sparsely hispid on the upper surface, scabrous beneath and sometimes with a few scattered hairs; panicles 12 to 20 cm. long, about 15 to 20 mm. thick, purplish, rather loose at least toward the base, nodding, the axis angled, densely pubescent; fascicles peduncled, spreading or reflexed; bristles slender, flexuous, unequal, the outer short, scabrous only, the inner mostly 1 to 1.5 cm. long, plumose below, the innermost one a little stronger and 2 to 2.5 cm. long; spikelets 1 to several in a fascicle, pedicellate, 5 to 7 mm. long, about 1.5 mm. wide, glabrous or scabrous; glumes acuminate-pointed, 1 to 3-nerved, the first one-fourth to one-third and the second about three-fourths the length of the spikelet; sterile and fertile lemmas subequal, acuminate-pointed, the tips usually spreading, 5-nerved, the sterile lemma inclosing a palea of equal length and a staminate flower, the fruit but slightly indurate, the tip of the palea free.

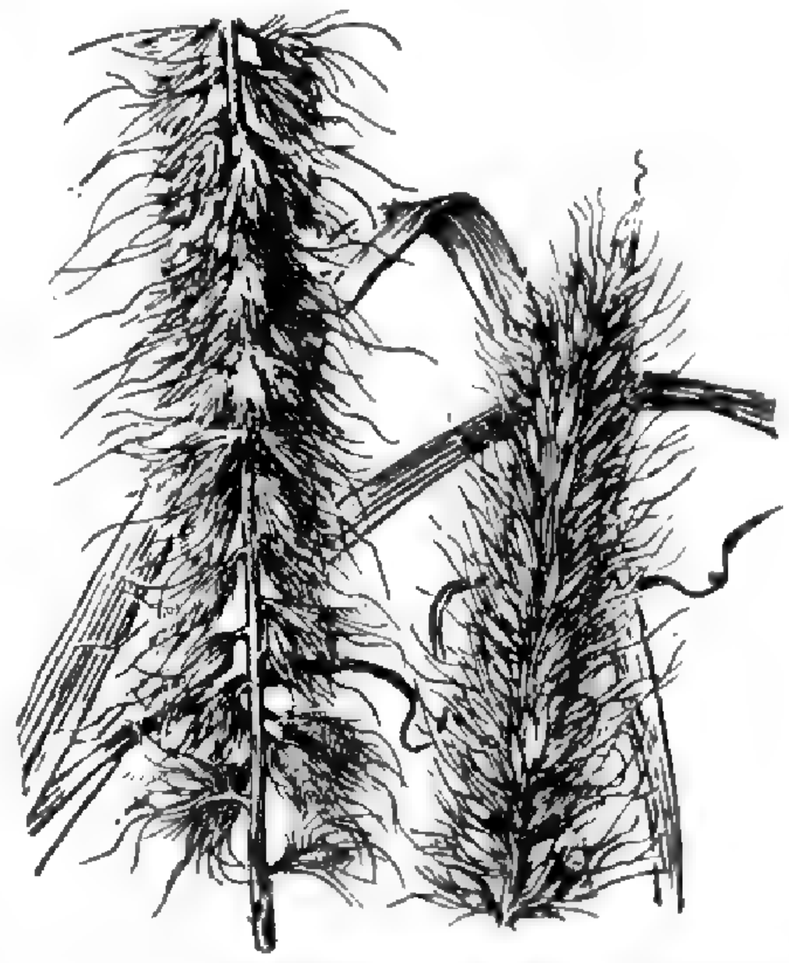

FIG. 64.—*Pennisetum orientale triflorum*. From *Amer. Gr. Nat. Herb.* 613, Jamaica.

DISTRIBUTION.

Native of India, introduced in the West Indies, where it is called Himalaya grass and is said to be a good forage grass; escaped from cultivation and found along trails and in open grassland (only American specimens are cited below).
JAMAICA: Cinchona, *Amer. Gr. Nat. Herb.* 613; *Hitchcock* 9700; *Harris* 11300, 11433.
TRINIDAD: Port of Spain, *Hitchcock* 10169.

3. Pennisetum ciliare (L.) Link.

Cenchrus ciliaris L. Mant. Pl. 302. 1771. "Habitat ad Cap. b. spei [Cape of Good Hope, Africa] * * * Koenig." The description indicates the dwarfed form found in arid situations.

Pennisetum ciliare Link, Hort. Berol. 1: 213. 1827. Based on *Cenchrus ciliaris* L. The habitat is given as "Caribaeis, Cumana."

Pennisetum cenchroides L. Rich. in Pers. Syn. Pl. 1: 72. 1805. Based on *Cenchrus ciliaris* L.

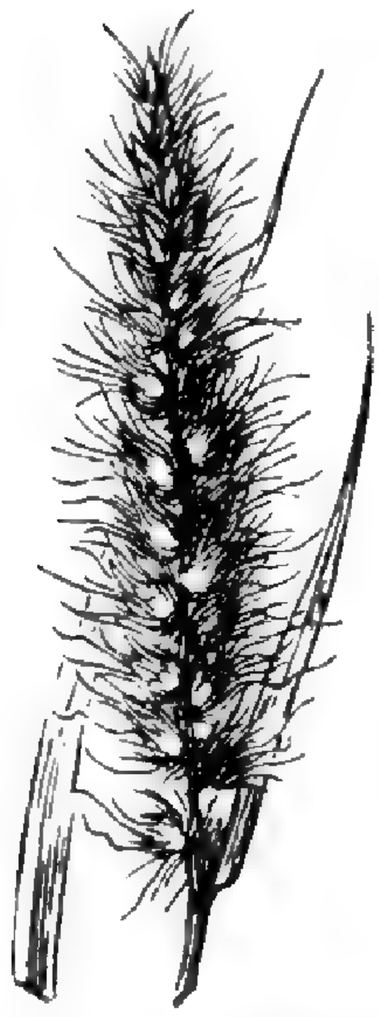

FIG. 65.—*Pennisetum ciliare*. From *Drummond*, Punjab, India.

DESCRIPTION.

Plants perennial, tufted from a knotted crown; culms geniculate, slender, 10 to 50 cm. tall, sometimes taller, sparingly branching, scabrous at least on the uppermost joint; sheaths minutely scabrous and usually pilose along the margin; ligule ciliate, about 1 mm. long, sometimes minute; blades flat or folded, 2 to 10 cm. long (longer in plants in moist situations), 3 to 5 mm. wide, scabrous on the upper surface and long-pilose toward the base, glabrous or nearly so beneath; panicle 1.5 to 10 cm. long, not dense, purplish, mostly flexuous, the axis slender, angled, scabrous; fascicles subsessile, spreading; bristles united at the very base, flexuous, unequal, the outer short, slender, scabrous only, the inner thicker, flattened, about twice the length of the spikelet, ciliate, the innermost one a little longer than the rest; spikelets 1 to 5 in a fascicle, sessile, 4 to 5.5 mm. long, about 1.5 mm. wide, scaberulous; glumes thin, 1 to 3-nerved, acute or abruptly mucronate, the first one-fourth to more than one-third, the second two-thirds to three-fourths, the length of the spikelet; sterile lemma shorter than the

fruit, thin, 5 to 7-nerved, with a slender mucronate tip, inclosing a palea of equal length and a staminate flower; fruit but little indurate, the lemma 5-nerved, with an attenuate spreading tip.

Sometimes cultivated for ornament in the Southern States. An allied species, *Pennisetum holcoides* (Roxb.) Schult.,[14] has been cultivated under the name "*P. ciliare*," while true *P. ciliare* has been more generally known as "*P. cenchroides*." In *P. holcoides* the bristles are very plumose, making the panicles soft and downy.

DISTRIBUTION.

Arid open ground, tropics and subtropics of the Eastern Hemisphere; sparingly introduced in the American tropics (only American specimens cited below).

GUATEMALA: Zacapa, *Pittier* 1751.
PORTO RICO: Ponce, *Britton, Cowell & Brown* 5380.

4. Pennisetum glaucum (L.) R. Br.

Panicum glaucum L. Sp. Pl. 56. 1753. "Habitat in Indiis." The first phrase name cited is "Panicum spica tereti, involucellis bifloris fasciculato-pilosis. Fl. zeyl. 44." The Flora Zeylanica is Linnaeus's own work, and the exceptionally detailed description given[15] seems to show that it was drawn up from the plant which is still preserved in the British Museum.[16] The description given in the Species Plantarum, "Setae in spica longitudine flosculorum. Foliorum vaginae oris pilosae, Dum spica recens prodiit Flosculi in series dispositi observantur," also applies wholly to the Ceylon specimen, as does the name "*glaucum*" itself. But Linnaeus confused the matter by citing four phrase names, besides that from Flora Zeylanica. One refers to a Plukenet figure that probably represents *Elytrophorus articulatus*. one is a Tournefort phrase that is unidentifiable, and two, given as β and γ, are identifiable as green foxtail, *Chaetochloa viridis* (L.) Scribn., and yellow foxtail, *C. lutescens* (Weigel) Stuntz, respectively. The variety γ was taken by subsequent authors as the basis of *P. glaucum* L. and the names *Setaria glauca* and *Chaetochloa glauca* have been applied to yellow foxtail.

Holcus spicatus L. Syst. Nat. ed. 10. **2:** 1305. 1759. A brief diagnosis, which applies to *P. glaucum* and fails to agree with the generic diagnosis of *Holcus* immediately above, is given, and "Pluk. t. 32. f. 4." is cited. Plukenet's figure[17] represents *P. glaucum*. No locality is mentioned, but Linnaeus later[18] gives "Habitat in India" for this species.

Cenchrus spicatus Cav. Descr. Pl. 304. 1802. Based on *Holcus spicatus* L. Kuntze (Rev. Gen. Pl. **3:** 346. 1898) published this combination anew, based on "*Penicillaria spicata* Willd."

Pennisetum typhoideum L. Rich. in Pers. Syn. Pl. **1:** 72. 1805. *Holcus spicatus* L. and Plukenet's figure, *pl. 32, f. 4*, are cited.

Penicillaria spicata Willd. Enum. Pl. 1037. 1809. Based on *Holcus spicatus* L.

Pennisetum glaucum R. Br. Prodr. Fl. Nov. Holl. **1:** 195. 1810. The name is based on *Panicum glaucum* L., though the plant to which Brown applied it was evidently a species of *Chaetochloa*.

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[14] Mant. **2:** 148. 1824.

[15] Fl. Zeyl. 18. 1847. (The number 44 refers to the species, which is no. 44.)

[16] For the identity of this specimen see Trimen (Journ. Linn. Soc. Bot. **21:** 136. 1896), and for the reasons for restoring this name to pearl millet see Stuntz, U. S. Dept. Agr. Bur. Pl. Ind. Inv. Seeds **31:** 84. 1914; Hitchcock, Amer. Journ. Bot. **2:** 299, 300. 1915. An analysis of the various Linnaean names that have been applied to pearl millet will appear in an early number of the American Journal of Botany.

[17] Phytogr. **1:** *pl. 32. f. 4.* 1691.

[18] Sp. Pl. ed. 2. **2:** 1483. 1763.

Setaria glauca Beauv. Ess. Agrost. 51, 178. 1812. The name is based on *Panicum glaucum* L., though Beauvois applied it to a species of *Chaetochloa*.

Pennisetum spicatum Roem. & Schult. Syst. Veg. **2:** 499. 1817, as synonym of *Penicillaria spicata* Willd.; Koern. in Koern. & Wern. Handb. Getreid. **1:** 284. 1885. Based on *Holcus spicatus* L.

Panicum spicatum Roxb. Fl. Ind. **1:** 286. 1820. Based on *Holcus spicatus* L.

Penicillaria plukeneti Link, Hort. Berol. **1:** 221. 1827. "P. Plukenetti *Hort. Plukenet Alm. t.* 32. *f.* 4. W[illdenow] E[numeratio] 1037." Both references are identifiable as *P. glaucum*.

Chamaeraphis glauca Kuntze, Rev. Gen. Pl. **2:** 767. 1891. Based on "*Setaria glauca* Beauv.," that being based on *Panicum glaucum* L. Kuntze applied the name to a species of *Chaetochloa*.

Ixophorus glaucus Nash, Bull. Torrey Club **22:** 423. 1895. Based on *Panicum glaucum* L., but the name applied to *Chaetochloa lutescens* (Weigel) Stuntz.

Chaetochloa glauca Scribn. U. S. Dept. Agr. Div. Agrost. Bull. **4:** 39. 1897. Based on *Panicum glaucum* L., but the name applied to *Chaetochloa lutescens* (Weigel) Stuntz.

There has been great confusion as to the names referable to this species. As Hooker says, "The synonymy of the species is almost inextricable." The synonymy here given includes only those names that are based on Linnaean names.

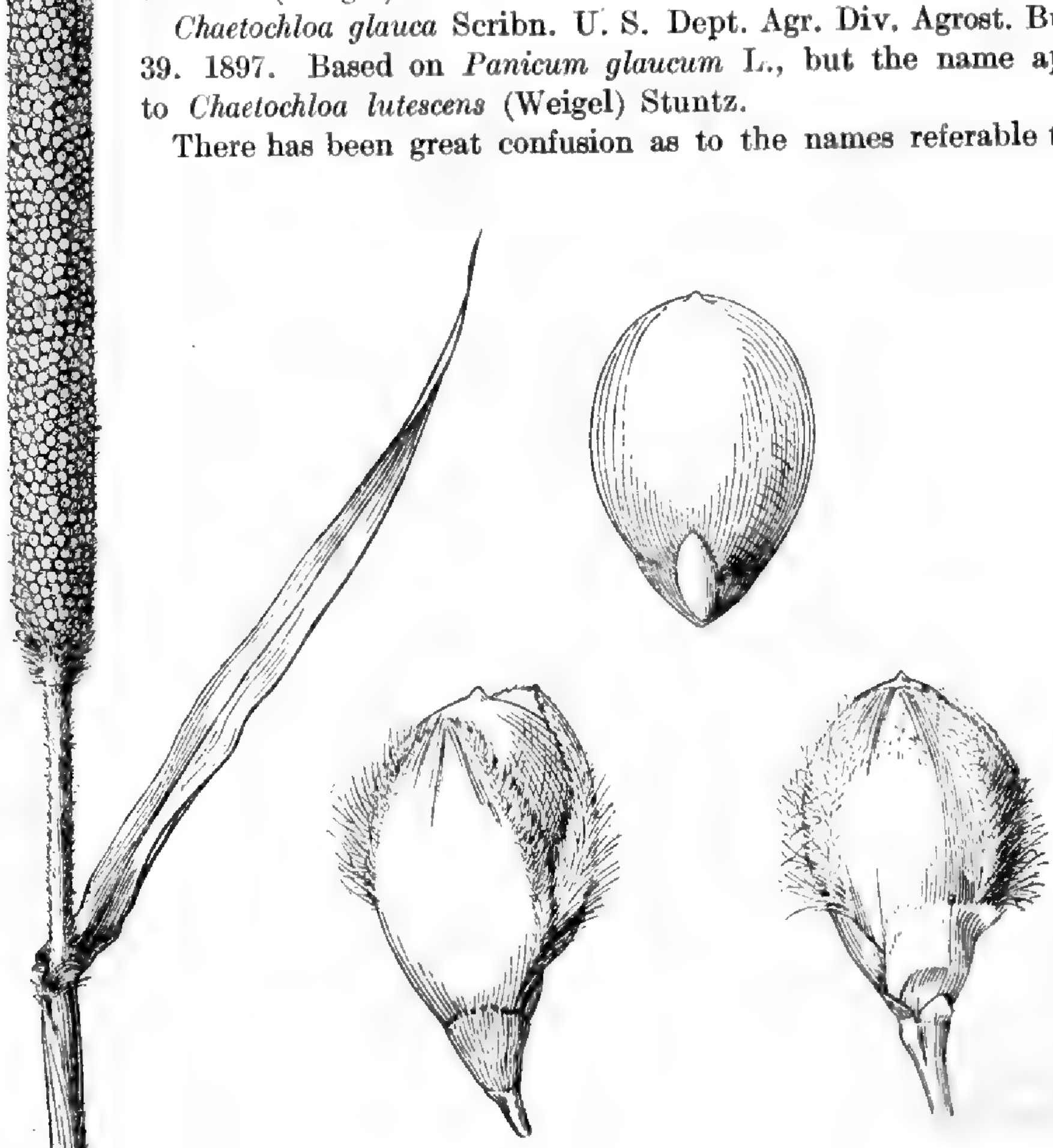

FIG. 66.—*Pennisetum glaucum*. From *McCarthy*, North Carolina.

Schumann [19] published the name *Pennisetum americanum*, based on *Panicum americanum* L., applying it to pearl millet. *Panicum americanum* L. is based on "Panicum americanum Clus. hist. 2, p. 215." Clusius's figure does not represent pearl millet, nor does his description apply to it. It is more like common millet (*Chaetochloa italica*) but was probably based on a confusion of two or more species. Schumann's name was accepted by Leeke.[20]

DESCRIPTION.

Plants annual, branching at the base, robust, as much as 2 meters tall; culms simple or rarely branching, densely villous below the panicle, often minutely so below the nodes, otherwise glabrous; nodes usually appressed-pubescent; sheaths loose, mostly overlapping, commonly scabrous and usually densely hairy on the margins toward the summit and on the collar; ligule densely hairy, about 3 mm. long; blades flat, cordate at base, sometimes as much as 1 meter long and 5 cm. wide, scabrous on both surfaces, the midnerve prominent; panicles cylindric, stiff, very dense, as much as 40 to 50 cm. long and 2 to 2.5 cm. thick, pale, bluish tinged, or sometimes tawny, the stout axis densely villous; fascicles on slender villous peduncles 2 to 5 cm. long, spreading; bristles unequal, the inner coarser, sparsely plumose below, about equaling the mature fruit; spikelets mostly 2 in a fascicle, short-pedicellate, at maturity 3.5 to 4.5 mm. long, obovate, turgid; glumes unequal, the first minute, the second one-fourth to half the length of the spikelet, ciliolate; sterile lemma slightly shorter than the fertile one, firm, obscurely nerved, ciliate at the broad summit, inclosing a villous palea and sometimes a staminate flower; fertile lemma indurate, abruptly pointed, long-ciliate on the margins, except at the base and apex, the palea broad, thinner, villous on the margins and toward the summit, the subglobose or pyriform ripe caryopsis forcing open the lemma and palea and equaling them, bluish lead color or whitish; anthers with a minute tuft of hairs at the tips.

DISTRIBUTION.

Known only in cultivation. Leeke [21] considers it a composite species having a polyphyletic origin, arising in cultivation from *Pennisetum gymnothrix* (A. Br.) Schum., *P. perottetii* (Klotzsch) Schum., *P. mollissimum* Hochst., *P. violaceum* (Lam.) L. Rich, and *P. versicolor* Schrad. These species are all natives of Africa. *Pennisetum glaucum* has numerous varieties and forms. It is an important food plant in Africa [22] and is also cultivated for its grain in India, Arabia, and southern Europe. In our Southern States it is grown to a limited extent for forage. It is sometimes called Indian millet, African millet, and cat-tail millet.

Pennisetum purpureum Schumach.,[23] a tropical African species, is being introduced as a fodder plant in the Southern States under the name Napier grass. In Africa it is also called elephant grass. It is a robust leafy tufted branching perennial, 2 to 4 meters tall, with elongate blades 2 to 3 cm. wide, and dense, stiff, tawny or purplish panicles, the fascicles sessile, the sparsely plumose bristles exceeding the two or three unequally pediceled spikelets.

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[19] In Engl. Pflanzenw. Ost-Afr. 5[B]: 51. 1895.

[20] Zeitschr. Naturw. 79: 52–96. 1907.

[21] Zeitschr. Naturw. 79: 55. 1907.

[22] For a full treatment of the varieties and their history see Koern. & Wern. Handb. Getreid. 1: 284. 1885; Schum. in Engl. Pflanzenw. Ost-Afr. 5[B]: 51–58. 1895; and Leeke, Zeitschr. Naturw. 79: 52–108. *pl. 2, 3.* 1907.

[23] Schumach. & Thonn. Beskr. Guin. Pl. 64. 1827. Described from Guinea, Africa.

5. Pennisetum karwinskyi Schrad.

Pennisetum karwinskyi Schrad. Linnaea **12:** 431. 1838. "Habit. in Mexico (Karwinsky)." In the Schrader Herbarium, which is preserved in the herbarium of the Botanical Garden at Petrograd, there are two sheets bearing this name, but no data. On one sheet are leaves only; on the other is a culm with a single purplish panicle about 5 cm. long. The fascicles of this panicle are smaller than usual for the species and the inner bristles are only sparsely short-ciliate. The description and the specimen represent a rather dwarfed plant such as Rose, Standley & Russell's no. 12866, from Alamos, Sonora.

Cenchrus multiflorus Presl, Rel. Haenk. **1:** 318. 1830. "Hab. in Mexico." The type specimen was examined by Professor Hitchcock in the herbarium of the German University at Prag. The fascicles are much like those of Pringle's no. 3849. Most of the bristles only slightly exceed the spikelets, the inner are more pilose than usual for the species, and one bristle is about twice as long as the rest, thicker, and stiffly flexuous.

Pennisetum multiflorum Fourn. Mex. Pl. **2:** 49. 1886. No locality or specimen is cited. The description is as follows: "Spica imbricata, spiculis quinis in eodem involucro, quarum 1-2 abortientes; gluma inferiore tertiam partem spiculae aequante superiore inferiorem duplam aequante; involucri setis exterioribus brevibus scabris; interioribus crassioribus in dimidia tantum inferiore parte ciliatis, spiculas duplo superantibus, seta una multo longiore." In the Copenhagen Herbarium is a specimen of Liebmann's no. 463 which bears the name "*Pennisetum multiflorum* Fourn." in Fournier's handwriting. This consists of a single naked elongate terminal joint and, in an envelope, a fragment, 5 cm. long, of a panicle, the fascicles with exceptionally slender bristles, scarcely at all ciliate, the innermost one as much as 3.5 cm. long (as in Nelson's no. 3065); three fascicles with short subequal bristles, the inner sparsely ciliate (as in Pringle's no. 2044); and a single bur of *Cenchrus pilosus* H. B. K. (the only American species of *Cenchrus* known in which the bristles are antrorsely scabrous). Since only the inflorescence is described, it seems certain that Fournier's description was based on this fragmentary specimen. The allusion to the ciliate lower part of the thickened inner bristles must have been made from observation of the bur of the *Cenchrus*. Fournier does not base the name on *Cenchrus multiflorus* Presl, though he is naming the same species. He includes *Cenchrus multiflorus* Presl in *Cenchrus*. Liebmann's nos. 341 and 464, which he cites under it, are in the Copenhagen Herbarium; no. 464 bears the name *Cenchrus multiflorus* in Fournier's hand, the other is marked "determ: Fournier." Both are *Pennisetum karwinskyi*.

DESCRIPTION.

Plants perennial, in loose clumps from hard knotted crowns, the culms produced from hard scaly bulblike buds bursting through the basal and underground sheaths; culms erect or ascending, simple or with leafy shoots from the lower nodes, mostly 1 to 1.5 meters tall, rarely only about 0.5 meter, very scabrous below the panicle, otherwise glabrous, the lower internodes compressed; sheaths keeled, mostly overlapping, pilose along the margin at least toward the summit, sometimes sparsely papillose-pilose, or rarely the lower densely pilose, throughout; ligule 1.5 to 2 mm. long, membranaceous-ciliate; blades usually rather firm, ascending or spreading, flat, 10 to 40 cm. long, 5 to 15 mm. wide, broadest at the base, tapering to a long, attenuate, very scabrous, usually involute tip, the upper surface scabrous and usually sparsely papillose-pilose, rarely densely so, sometimes scabrous only, the lower surface usually scabrous, sometimes smooth, the margins very scabrous; panicle rather stiff or slightly flexuous, 5 to 17 cm. long, mostly 10 to 12 mm wide, excluding the longest bristles, tawny or purplish or sometimes greenish, mostly dense except at the base, but sometimes the fascicles rather loosely arranged, the axis strongly angled, pubescent;

fascicles subsessile, ascending or spreading; bristles united at the very base, unequal, the outer short and slender, the inner stout, flattened and sparsely ciliate below (sometimes scabrous only but with some ciliate in the same fascicle, rarely none ciliate), commonly erect or appressed with ascending tips, 5 to 8 mm. long, the innermost sometimes 15 to 25 cm. long, rarely longer, flexuous (this innermost bristle commonly elongate in the lower fascicles and not in the upper in the same panicle, but sometimes elongate in all and sometimes not in any); spikelets 1 to 5 in each fascicle, sessile, 5 to 6 mm. long, about 1.3 mm. wide, glabrous or scaberulous; glumes thin, acute, the first 1-nerved, one-third to half the length of the spikelet, the second 5 to 7-nerved, two-thirds to three-fourths the length of the spikelet, or the attenuate tip elongate; sterile lemma slightly shorter than the fertile one, 5 to 7-nerved, acuminate, inclosing a palea of about equal length and usually a staminate flower; fruit subindurate, the apex attenuate and spreading.

In this species the fascicles vary greatly in size. Specimens with few-flowered fascicles and short bristles appear distinct from those with fascicles of 4 or 5 spikelets and elongate innermost bristles, but in several specimens almost the entire range of variation in fascicles is found from base to summit of a single panicle. The type specimen of *Cenchrus multiflorus* and that of *Pennisetum multiflorum* represent about the extremes of inflorescence, the first with short, relatively thick, bristles, plentifully ciliate, the second with long, very slender bristles, very sparingly or not at all ciliate. Jiménez's no. 522 has an exceptionally large panicle, the innermost bristles of all fascicles elongate, a few of them 5 cm. long.

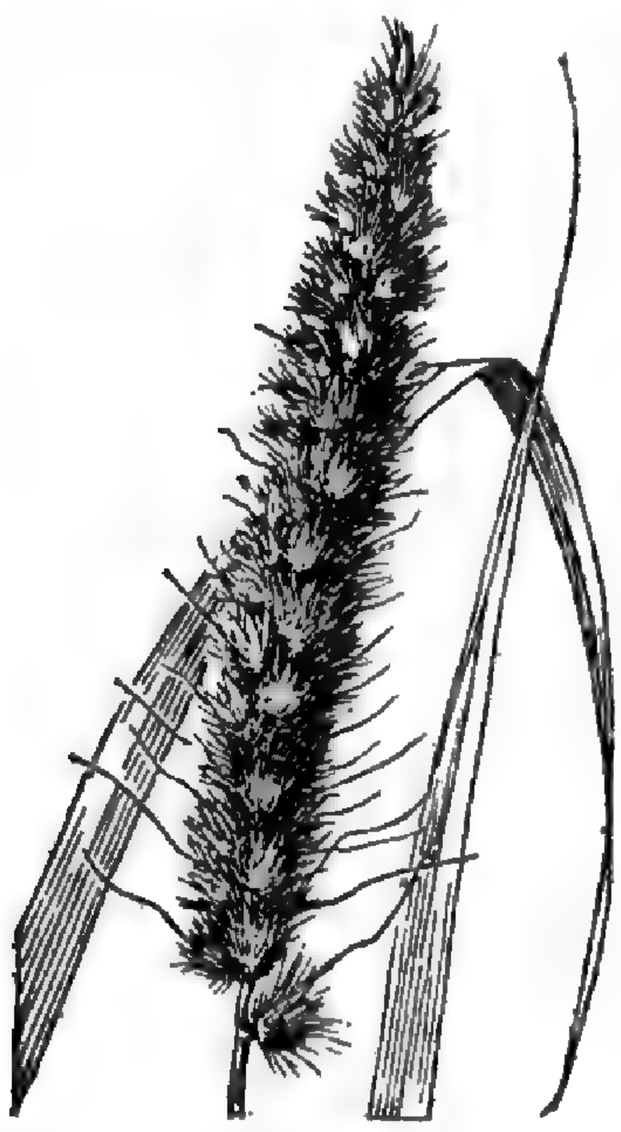

FIG. 67.—*Pennisetum karwinskyi*. From *Pringle* 3849, Mexico.

DISTRIBUTION.

Rocky, open, dry or moist slopes, mostly in the uplands, from Mexico to Costa Rica.

SONORA: Alamos, *Rose, Standley & Russell* 12866.

JALISCO: Guadalajara, *Hitchcock* 7342, 7364; *Holway* 3; *Pringle* 2044, 3849, 11327.

GUERRERO: Balsas, *Hitchcock* 6791. Acapulco, *Palmer* 75 in 1895.

OAXACA: San Agustín, *Liebmann* 341. Oaxaca, *Galeotti* 5880.

CHIAPAS: Between San Ricardo and Ocozocuantla, *Nelson* 2895. Ocuilapa, *Nelson* 3065.

COSTA RICA: Nuestro Amo, *Jiménez* 522.

6. Pennisetum setosum (Swartz) L. Rich.

Cenchrus setosus Swartz, Prodr. Veg. Ind. Occ. 26. 1788. "India occidentalis." The type specimen in the Swartz Herbarium at Stockholm was examined by A. S. Hitchcock.

Panicum cenchroides L. Rich. Act. Soc. Hist. Nat Paris **1**: 106. 1792. "E Cayenna missarum a Domino Le Blond." The type has not been examined. The description is insufficient for identification. The name is referred here on the authority of Doell.[25]

Pennisetum setosum L. Rich. in Pers. Syn. Pl. **1**: 72. 1805. Based on *Cenchrus setosus* Swartz.

[25] In Mart. Fl. Bras. **2**[2]: 306. 1877.

Pennisetum purpurascens H. B. K. Nov. Gen. & Sp. **1**: 113. 1816. "Mexicani, Volcan de Jorullo." The type has not been examined, but the description applies well to the robust plants of Mexico. The blades are described as scabrous on the upper surface and on the margin and glabrous beneath, and the sterile floret as having a palea.

Pennisetum uniflorum H. B. K. Nov. Gen. & Sp. **1**: 114. *pl. 54*. 1816. "Prov. Novae Andalusiae, juxta Cumanacoa," [Venezuela]. The description and plate identify the species. The sheaths are described as pubescent, the blades scabrous on the upper surface and margin, and glabrous beneath; the sterile lemma empty.

Panicum densispica Poir. in Lam. Encycl. Suppl. **4**: 273. 1816. Based on "*Panicum cenchroides* Rich. non Lam."

Panicum triticoides Poir. in Lam. Encycl. Suppl. **4**: 274. 1816. Described from a specimen in Desfontaines's herbarium, its source unknown. The type has not been examined. The description applies well to *Pennisetum setosum*, to which Doell[26] refers it. The sheaths are described as glabrous but pilose at the mouth, the blades as rough and sparsely pilose on both surfaces.

Setaria cenchroides Roem. & Schult. Syst. Veg. **2**: 495. 1817. Based on *Panicum cenchroides* L. Rich.

Pennisetum triticoides Roem. & Schult. Syst. Veg. **2**: 877. 1817. Based on *Panicum triticoides* Poir.

Gymnothrix geniculata Schult. Mant. **2**: 284. 1824. "Setaria geniculata Sieb. Fl. Martin. * * In Martinica." The detailed description identifies the species. The sheaths are described as glabrous and the blades as scabrous on both surfaces.

Pennisetum alopecuroides Desv.; Hamilt. Prodr. Pl. Ind. Occ. 11. 1825. "India occidentali." The type has not been examined. The description of the "involucre" as pilose identifies the species. The sheaths are described as glabrous and the blades as subscabrous.

?Pennisetum erubescens Desv.; Hamilt. Prodr. Pl. Ind. Occ. 11. 1825. "St. Thomas." The brief diagnosis is insufficient for identification, but the species is probably *P. setosum*. The leaves are not described.

Pennisetum richardi Kunth, Rév. Gram. **1**: 49. 1829. Based on *Panicum cenchroides* L. Rich.

Pennisetum sieberi Kunth, Rév. Gram. **1**: 50. 1829. Based on "Gymnothrix geniculata Schult.—*Setaria geniculata* Sieb, herb. Mart."

Pennisetum hirsutum Nees, Agrost. Bras. 284. 1829. "In ripa fluminis S. Francisci ad Joazeiro provinciae Bahiensis et Pernambucensis; nec non in * * * provinciae Piauhiensis." The specimen collected by Martius in Bahia, which was examined by A. S. Hitchcock in the Munich Herbarium, is probably the type. The sheaths are described as tuberculate-pilose toward the summit and the lower blades as tuberculate-pilose on both surfaces, the upper blades as sparsely pilose.

Pennisetum pallidum Nees, Agrost. Bras. 285. 1829. "Habitat. * * * ad latera montium de Mentanha et Itambé, districtus adamantini, provinciae Minarum." The type specimen, collected by Martius, was examined by A. S. Hitchcock in the Munich Herbarium. The sheaths and blades are described as tuberculate-hirsute.

Pennisetum flavescens Presl, Rel. Haenk. **1**: 316. 1830. "Hab. in Mexico." The type specimen was examined by A. S. Hitchcock in the herbarium of the German University at Prag. The sheaths are described as smooth, the blades as nearly glabrous beneath and tuberculate-villous above.

Pennisetum dasistachyum Desv. Opusc. 76. 1831. "Habitat in Guyana." The type has not been examined. The description of the bristles identifies the species. Desvaux cites "Panicum cenchroides Rich. nec Lamk., densi-spica Poir." as synonyms. The sheaths and blades are described as glabrous, the sheaths bearded at the mouth.

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[26] In Mart. Fl. Bras. **2**[1]: 306. 1877.

Pennisetum hamiltonii Steud. Nom. Bot. ed. 2. **2:** 297. 1841. Based on "P. alopecuroides Hamilt. (non Spr. nec. Steud.)."

Pennisetum nicaraguense Fourn. Bull. Soc. Bot. France II. **27:** 293. 1880. "Circa Granada (n. 1304)," Nicaragua, the specimen collected by Paul Lévy. The type has not been examined. The description applies well to the robust plants with hirsute blades collected by A. S. Hitchcock in Nicaragua (nos. 8708, 8738).

Pennisetum indicum var. *purpurascens* Kuntze, Rev. Gen. Pl. **2:** 787. 1891. Based on *Pennisetum purpurascens* H. B. K.

In Leeke's [28] revision *Pennisetum setosum* is included under *P. indicum* (Murray) Kuntze, and the American plants as well as those of India and Africa are referred to var. *typica*. The plant of India is an annual, much more freely branching than is *P. setosum*, and has more slender, less dense panicles. It was described by Linnaeus as *Panicum polystachion* [29] and transferred by Schultes [30] to *Pennisetum*. Linnaeus, following a brief diagnosis, cites "*Rumph. amb.* 6. *t.* 7. *f.* 2. B." Merrill [31] identifies the Rumphian plant as *Setaria flava* (Nees) Kunth, and says that this "Rumphian reference is the whole basis" of *Panicum polystachion* L. Since Linnaeus gives a diagnosis of his own, however, (which does not agree with the Rumphian figure) I should take his own specimen as the basis of his species. Dr. Stapf states, in a letter, that in the Linnaean Herbarium there is a specimen of "the *Pennisetum setosum* of India" [that is, the species which has commonly been so called] "written up by Linnaeus himself *polystachyum*." If the name *Pennisetum indicum* (Murray) Kuntze [32] were properly referable to this species it would be antedated by *P. polystachyum* (L.) Schult. Dr. Stapf holds that *Alopecurus indicus* Murray (Syst. Veg. ed. 13. 92. 1774), upon which *Pennisetum indicum* Kuntze is based, was based on *Panicum alopecuroides* of Linnaeus's Mantissa. Murray cites "Panicum alopecuroides Spec. plant. 82," but his description is copied verbatim from the Mantissa (p. 322, 1771) and not from the second edition of the Species Plantarum, the page reference to which he gives, nor from the first. In the Mantissa Linnaeus changes the application of the name. Following "Panicum *alopecuroid.* Excludatur et reformatum restituatur sequentibus" he gives a description that is based on some plant having pilose culm, sheaths, and blades, and apparently an inflorescence of pearl millet or of common millet. *Panicum alopecuroides*, "Habitat in China," of the first edition of the Species Plantarum (p. 55) was based on a plant undoubtedly sent to him by Osbeck.[33] In his Dagbok ofwer Ostindsk resa, published in 1757, under date of September 27, 1751, Osbeck lists "*Panicum alopecuroides*" without description, among plants observed growing along hedgerows near Canton. Dr. Stapf, who at our request kindly examined the Chinese plant in the Linnaean Herbarium, identifies it with *Pennisetum compressum* R. Br., specimens of which from China agree perfectly with Linnaeus's description.

Leeke [34] refers *Panicum vulpisetum* Lam.,[35] described from Santo Domingo, to *P. indicum*. We have not seen Lamarck's specimen but the description (particularly that of the spike as repeatedly subdivided) applies not to *P. setosum*, but to *Chaetochloa vulpiseta* (Lam.) Hitchc. & Chase, as described in the Grasses of the West Indies.[36] Lamarck mistakenly cited Sloane's plate 70, figure 1, thus giving an erroneous impression of his species, which he described from a specimen in the herbarium of

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[28] Zeitschr. Naturw. **79:** 17–19. 1907.

[29] Syst. Nat. ed. 10. **2:** 870. 1759.

[30] Mant. **2:** 146. 1824.

[31] Rumphius's Herb. Amboinense 91. 1917.

[32] Rev. Gen. Pl. **2:** 787. 1891.

[33] See Merrill on Osbeck's Dagbok in Amer. Journ. Bot. **3:** 571. 1916.

[34] Zeitschr. Naturw. **79:** 18. 1907.

[35] Encycl. **4:** 735 (err. typ. 745). 1798.

[36] Contr. U. S. Nat. Herb. **18:** 350. 1917.

Desfontaines. The specimen in the Sloane Herbarium from which the cited figure was drawn is *Imperata caudata*.[37]

DESCRIPTION.

Plants perennial, in loose clumps, sometimes of 30 or more culms; culms usually 1 to 2 meters tall, slender to robust, subcompressed, ascending or suberect from the more or less geniculate, sometimes rooting lower nodes, bearing one to several flowering branches from the lower and middle nodes, scabrous below the panicle, otherwise glabrous; sheaths loose, from glabrous to rather densely papillose-hirsute, usually sparsely hirsute along the margin toward the summit, and otherwise glabrous; ligule membranaceous-ciliate, 2 to 3 mm. long; blades mostly rather firm, ascending or spreading, 10 to 40 cm. long, 4 to 18 mm. wide, tapering toward the base (or the reduced upper blades widest at base), acuminate into a long, slender, very scabrous tip, from scabrous on both surfaces (or rarely glabrous beneath) to rather densely papillose-hirsute on both surfaces, more commonly scabrous beneath and sparsely papillose-hirsute above, always stiffly hairy back of the ligule; panicles terminating the primary culm and branches, occasionally one or two axillary panicles borne in the upper sheaths, 10 to 25 cm. long, 8 to 10 mm. thick, excluding the elongate bristles, rather dense, usually somewhat nodding, from pale yellow to dusky purple or brown, the axis slender, scabrous; fascicles sessile, at first ascending, spreading or often reflexed in age; bristles unequal, the outer delicate, scabrous only, most of them shorter than the spikelet, the inner densely silky-plumose below, the hairs directed inward, those of the erect lower part of adjoining bristles matted and beautifully crimped, the bristles spreading above; spikelets solitary, sessile, 3.2 to 4 mm. long, 0.8 to 1 mm. wide, the glumes and sterile lemma very thin; first glume usually minute, often obsolete; second glume exceeding the sterile lemma and the fruit, 5-nerved, abruptly acuminate, ciliolate, sometimes obscurely erose or lobed; sterile lemma 5-nerved, ciliolate, minutely 3-lobed at the truncate apex, the palea sometimes and, less often, a staminate flower developed; fruit indurate, smooth and shining, 2 to 3 mm. long, 0.8 to 1 mm. wide, the narrowed apex of both lemma and palea stiffly ciliate-fringed.

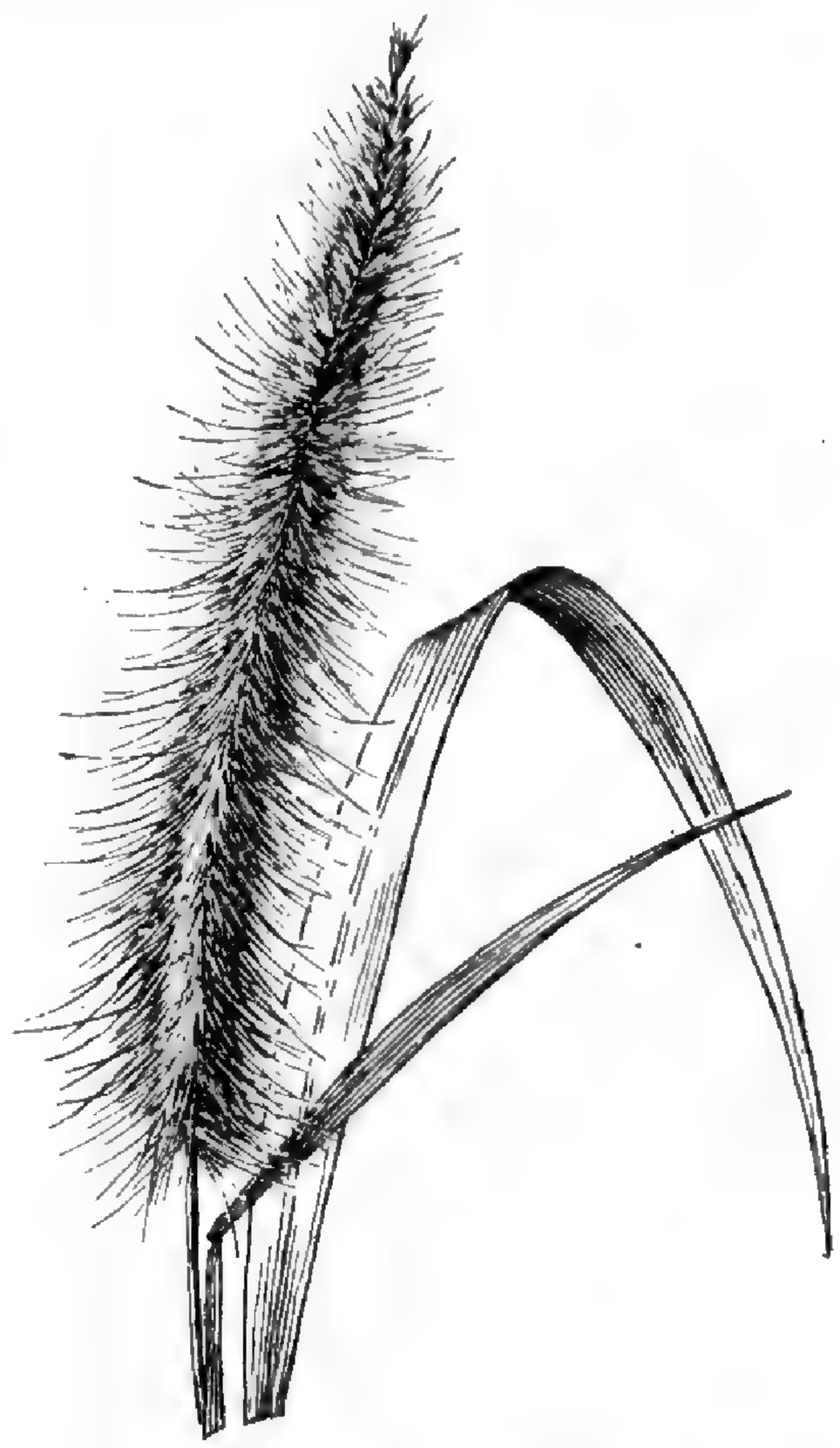

FIG. 68.—*Pennisetum setosum*. From *Amer. Gr. Nat. Herb.* 611, Trinidad.

In this species the pubescence of the foliage is exceedingly variable, but the floral characters are unusually constant.

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[37] See Hitchcock, Contr. U. S. Nat. Herb. **12**: 133. 1908. It is pertinent in this connection to quote Merrill's observation (Interpretation of Rumphius's Herbarium Amboinense, p. 27. 1917): "It is not at all certain that in quoting illustrations of various species as synonyms Linnaeus and his contemporaries and immediate successors intended them as exact synonyms; it would seem, in many cases at least, that the citation of illustrations as synonyms was intended to convey to other botanists some conception of what the species was like, and not necessarily to indicate that it was an exact equivalent of the species under which it was cited."

Pennisetum breve Nees [38] of Brazil is very closely related to *P. setosum*. Doell reduces it to a variety of that. The type of this, collected by Martius in Bahia, was examined by A. S. Hitchcock in the Munich Herbarium. It is not here included because the plants are much smaller and the fascicles and spikelets are larger. None of this form is found among North American collections; our few specimens are from near Rio de Janeiro. *Panicum alopecuros* Lam.[39] (not *Pennisetum alopecuros* (Nees) Steud. 1854), described from Brazil, the type of which, from Rio de Janeiro, was examined by A. S. Hitchcock, in the Lamarck Herbarium in Paris, belongs to this form.

DISTRIBUTION.

Open slopes and savannas, southern Florida and southern Mexico, through Central America and the West Indies to Brazil, reaching its greatest development on rocky slopes of Mexico and Central America. Specimens from Ashantee, Africa, appear to belong to this species, possibly introduced from America.

FLORIDA: Estero [40] Bay, *Garber* 28; *Sargent* in 1905.
JALISCO: Río Blanco, *Palmer* 677 in 1886. Guadalajara, *Pringle* 1740.
VERACRUZ: Jalapa, *Hitchcock* 6544. Zacuapan, *Purpus* 2154.
MORELOS: Cuernavaca, *Pringle* 11241.
COLIMA: Alzada, *Amer. Gr. Nat. Herb.* 433; *Hitchcock* 7094. Colima, *Palmer* 1269 in 1891.
GUERRERO: Between Petatlán and Chilapa, *Nelson* 2149. Acapulco, *Palmer* 433 in 1895.
OAXACA: Oaxaca, *Hitchcock* 6187. Trapiche de la Concepción, *Liebmann* 336, 337, 342.
CHIAPAS: Tuxtla, *Nelson* 3090.
GUATEMALA: Alta Verapaz, *Pittier* 217.
HONDURAS: San Pedro Sula, *Thieme* 636 (J. D. Smith no. 5582).
SALVADOR: Santa Ana, *Hitchcock* 8795. San Salvador, *Renson* 324.
NICARAGUA: Masaya, *Hitchcock* 8708, 8733, 8738. Jinotepe, *Hitchcock* 8702.
COSTA RICA: Between Boruca and Lagarto, *Tonduz* (or *Pittier*) 4457. Surubres, *Biolley* 17382. Nicoya, *Tonduz* 13751. Atenas, *Hitchcock* 8515. Guanacaste, *Jiménez* 698. Rodeo, *Pittier* 1614. Pacaca, *Pittier* 3287.
PANAMA: Taboga Island, *Hitchcock* 8095.
CUBA: San Juan de Buenavista, *Wright* 3471.
JAMAICA: Without locality, *Swartz*.
LEEWARD ISLANDS: St. Christopher, *Hitchcock* 16349. Guadeloupe, *Duss* 4152. Dominica, *Hitchcock* 16436; *Jones* 5.
WINDWARD ISLANDS: Martinique, *Duss* 1316, 4017; *Hahn* 1012. Barbados, *Dash* 346.
TRINIDAD: Icacos, *Amer. Gr. Nat. Herb.* 611; *Broadway* 4964. St. Joseph, *Amer. Gr. Nat. Herb.* 612.
TOBAGO: Plymouth, *Hitchcock* 10235. Adelphi, *Broadway* 4683.
COLOMBIA: Corinto, *Pittier* 989. Sabanas del Credo, *Pittier* 1487. Santa Marta, *Smith* 156, 2532. Without locality, *Linden* 1560; *Triana* 340.
VENEZUELA: Dos Caminos, *Pittier* 5756. Ocumare de la Costa, *Pittier* 6053. Valencia, *Carreño* 8237. Without locality, *Fendler* 1683.
BRAZIL: Ceara, *Gardner* 1885. Piauhy, *Gardner*. Pará, *Goeldi* 81, 217.
BOLIVIA: Coripati, *Bang* 2168.

[38] Agrost. Bras. 281. 1829.
[39] Tabl. Encycl. 1: 169. 1791.
[40] Four specimens of this collection in the National Herbarium are all labeled "Lastero" or "Laster's" Bay. This is obviously an error in copying the name from Garber's original notes.

7. Pennisetum antillarum (Poir.) Desv.

Panicum antillarum Poir. in Lam. Encycl. Suppl. **4**: 275. 1816. "Antilles (V. s. in herb. Desfont.)." The type specimen or a duplicate of it was examined by A. S. Hitchcock in the herbarium of the Botanical Garden at Florence and a fragment of inflorescence was given him for the National Herbarium. So far as known this is the only collection of this species in existence. The description given below, except that of the inflorescence, is translated from Poiret's desc iption and that of Desvaux.

Saccharum? antillarum Roem. & Schult. Syst. Veg. **2**: 877. 1817. Based on *Panicum antillarum* Poir.

Setaria antillarum Kunth, Rév. Gram. **1**: 46. 1829. Based on *Panicum antillarum* Poir.

Pennisetum antillarum Desv. Opusc. 76. 1831. Based on *Panicum antillarum* Poir.

DESCRIPTION.

Plants probably perennial; culms erect, slender, terete, branching, scabrous below the panicle, otherwise glabrous; sheaths pilose, ciliate at the throat; blades narrowly linear, acuminate, pilose on the upper surface at least toward the base, glabrous beneath; panicle 8 to 15 cm. long, very slender, acuminate, rather dense, the slender angled axis minutely scaberulous; fascicles sessile, spreading; bristles scant, very slender, unequal, most of them about equaling the spikelet, the innermost conspicuously longer, 4 to 6 mm. long; spikelets solitary, sessile, 2 to 2.5 mm. long; glumes and sterile lemma thin, brownish, ciliolate, the first minute, sometimes obsolete, the second exceeding the sterile lemma and the fruit, 5 to 7-nerved, minutely 3-lobed at the apex, the middle lobe acute, exceeding the lateral ones; sterile lemma 3 to 5-nerved, minutely 3-lobed, the middle lobe reduced to a mucro, the palea obsolete; fruit about 1.5 mm. long and 0.4 mm. wide, indurate, smooth and shining, the narrowed apex of both lemma and palea ciliate-fimbriate.

The spikelet and particularly the indurate, fimbriate-tipped fruit show relationship to *Pennisetum setosum*.

Known from a single collection from "Antilles."

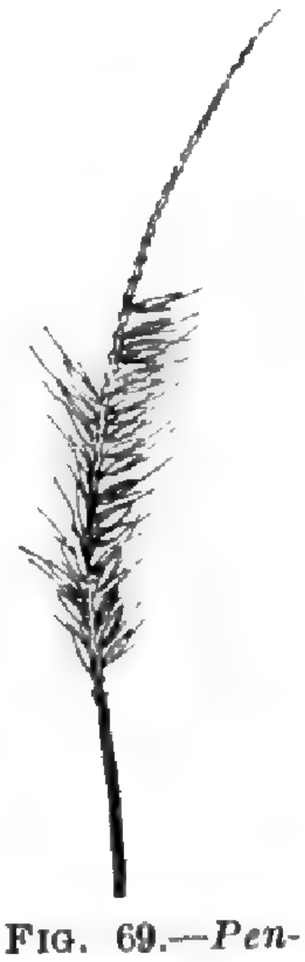

FIG. 69.—*Pennisetum antillarum*. From type specimen.

8. Pennisetum crinitum (H. B. K.) Spreng.

Gymnothrix crinita H. B. K. Nov. Gen. & Sp. **1**: 112. 1816. "Crescit in littore lacus Cuiseo [Lake Cuitzeo, Michoacán] prope La Puerta de Andaracuas, et juxta S. Rosa, * * * in regno Mexicano." The type specimen has not been examined, but the detailed description agrees perfectly with the numerous specimens from the region whence came the type.

Pennisetum crinitum Spreng. Syst. Veg. **1**: 302. 1825. Based on *Gymnothrix crinita* H. B. K.

Pennisetum humboldtianum Hemsl. Biol. Centr. Amer. Bot. **3**: 508. 1885. Based on *Gymnothrix crinita* H. B. K.

DESCRIPTION.

Plants perennial, glabrous as a whole; culms solitary or few together, erect from a curved or slightly geniculate base, robust, usually 2 meters or more tall, commonly bearing leafy flowering branches from all but the lower nodes, these often bearing sterile branches; internodes conspicuously channeled on the side toward the sheath, the lower mostly compressed, relatively short, the upper elongate; sheaths much shorter than the internodes, rather loose; ligule stiffly ciliate, about 0.5 mm. long; blades erect or ascending, rather thick, flat, those of the main culm 20 to 40 cm. long, 8 to 18 mm. wide, broadest at the base, those of the branches smaller; primary panicles usually

rather short-exserted, mostly stiffly erect, 12 to 25 cm. long, about 10 mm. thick, excluding the longer bristles, dense or sometimes loose at the base, stramineous or tawny or sometimes with pale bristles and greenish purple spikelets, the axis ridged, scabrous, toward the base often 2 mm. thick, the panicles of the branches commonly partly included, shorter, more slender, less densely flowered; fascicles sessile, ascending; bristles scant, unequal, most of them scarcely exceeding the spikelet, the outer shorter or two or three of them sometimes a little longer, the innermost stouter, 12 to 20 cm. long; spikelets solitary, sessile, 5 to 6 mm. long, about 1.3 mm. wide, acuminate, often blotched with purple, scaberulous toward the summit; first glume one-fourth to half the length of the spikelet, 1-nerved, acute or subacute; second glume slightly shorter than the fruit, 5-nerved, subacute; sterile lemma equaling the fruit or slightly exceeding it, 5-nerved, acuminate, the palea obsolete; fruit indurate, 4.5 to 5 mm. long, about 1.3 mm. wide, acuminate, the tip often spreading, the tip of the palea free.

DISTRIBUTION.

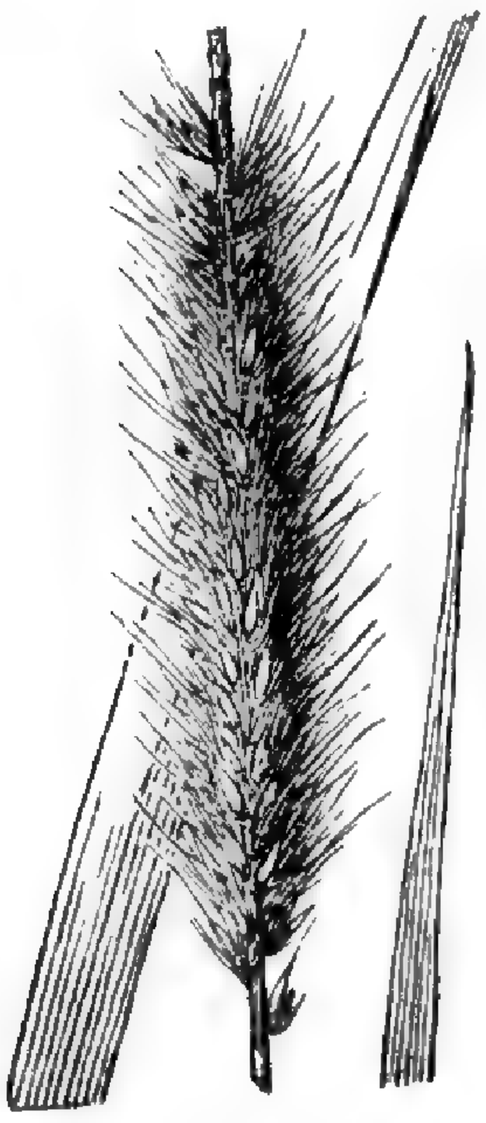

FIG. 70.—*Pennisetum crinitum*. From *Arsène* in 1910, Mexico.

Moist meadows or wet open ground, in the highlands of southern Mexico.

JALISCO: Río Blanco, *Palmer* 514 in 1886.
GUANAJUATO: Irapuato, *Hitchcock* 7397. Acámbaro, *Amer. Gr. Nat. Herb.* 432; *Pringle* 2608.
VERACRUZ: Río Blanco near Orizaba, *Hitchcock* 6343.
MEXICO: Lechería, *Pringle* 13251.
MICHOACAN: Morelia, *Holway*[41] 3593; *Pringle* 4316; *Arsène* in 1909 and 1910. Pátzcuaro, *Holway* 3629.

9. Pennisetum complanatum (Nees) Hemsl.

Gymnothrix complanata Nees, Bonplandia **3**: 83. 1855. "Seemann n. 1560. Panama." The description indicates an exceptionally small plant with decumbent base, such as Pittier's no. 1901a from Salvador. The type specimen is in the herbarium of the British Museum. Two fascicles from the panicle were kindly sent by Dr. Rendle for deposit in the National Herbarium.

Pennisetum complanatum Hemsl. Biol. Centr. Amer. Bot. **3**: 507. 1885. Based on *Gymnothrix complanata* Nees.

Gymnothrix mexicana Fourn. Mex. Pl. **2**: 48. 1886. "Orizaba * * * (BOURG[EAU] n. 3139, SCHAFFN[ER] n. 105, 174, THOMAS in herb. BUCHINGER, F. MÜLL[ER] n. 2015, BOTT[ERI] n. 143, 1486); Papantla (LIEBM[ANN] n. 344)." The name was earlier listed without description by Hemsley.[42] A specimen of Bourgeau's no. 3139 is in the National Herbarium. Liebmann's no. 344 in the Copenhagen Herbarium, bearing the name in Fournier's writing, has also been examined.

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[41] Dr. Holway's Mexican grasses collected in 1899 were sent to the agrostologist of the Department of Agriculture with labels bearing the name, locality, date, and collector's number, but without the name of the collector. By some mischance the collections were attributed to Dr. J. N. Rose, whose name was written by some clerk on the Department of Agriculture label. It was only after the publication of Hitchcock's Mexican Grasses (Contr. U. S. Nat. Herb. **17**: 181–389. 1913) that the mistake was discovered. This and other specimens collected by Holway are there cited as Rose's.

[42] Biol. Centr. Amer. Bot. **3**: 508. 1885.

Gymnothrix grisebachiana Fourn. Mex. Pl. **2**: 48. 1886. "Mirador (SCHAFFN[ER] n. 185. pl. ed. Hohen.)." A specimen of Schaffner's no. 185 was examined by A. S. Hitchcock in the Grisebach Herbarium at Göttingen.

Pennisetum mexicanum Hemsl. Biol. Centr. Amer. Bot. **3**: 508. 1885, nom. nud.; Ind. Kew. **2**: 458. 1894. Based on *Gymnothrix mexicana* Fourn.

DESCRIPTION.

Plants perennial; culms solitary or few together, erect or ascending from a strong rhizome, 1 to 2 meters tall, sometimes dwarfed, scabrous below the panicle, otherwise glabrous, simple or, more commonly, with one or two, rarely with several, flowering branches, the lower nodes sometimes geniculate, the internodes terete (or the lower slightly compressed) slightly or not at all channeled, not elongate and naked; sheaths loose, commonly as long as the internodes or longer, pilose on the margin at the summit, sometimes pubescent on the collar; ligule ciliate, about 2 mm. long; blades thinner than in *P. crinitum*, mostly somewhat spreading, flat, or folded at base, 20 to 55 cm. long, 5 to 8 or rarely 10 mm. wide, glabrous beneath, very scabrous on the upper surface, often papillose-pilose toward the base and with stiff hairs just back of the ligule, attenuate into an elongate involute setaceous tip; panicles nodding or somewhat flexuous, 7 to 16 cm. long, about 10 to 12 mm. thick, excluding the longest bristles, not so dense as in *P. crinitum*, with tawny or purplish bristles and pale spikelets, the slender axis ridged and scabrous; fascicles on very minute bearded peduncles, ascending; bristles numerous, unequal, most of them exceeding the spikelet, several to many, 12 to 15 mm. long, the innermost 15 to 25 mm. long, but usually not conspicuous as in *P. crinitum;* spikelet solitary, sessile, 6 to 7 mm. long, about 1.8 mm. wide, rather abruptly pointed, minutely scaberulous; first glume one-fourth to one-third the length of the spikelet, thin, 1-nerved, acute to truncate; second glume two-thirds to three-fourths as long as the fruit, 5-nerved, acute or subacute; sterile lemma slightly shorter than the fruit, 5-nerved, acuminate, inclosing a palea of equal length and usually a staminate flower; fruit rather less indurate than in *P. crinitum*, acuminate-tipped, the tip of the palea free.

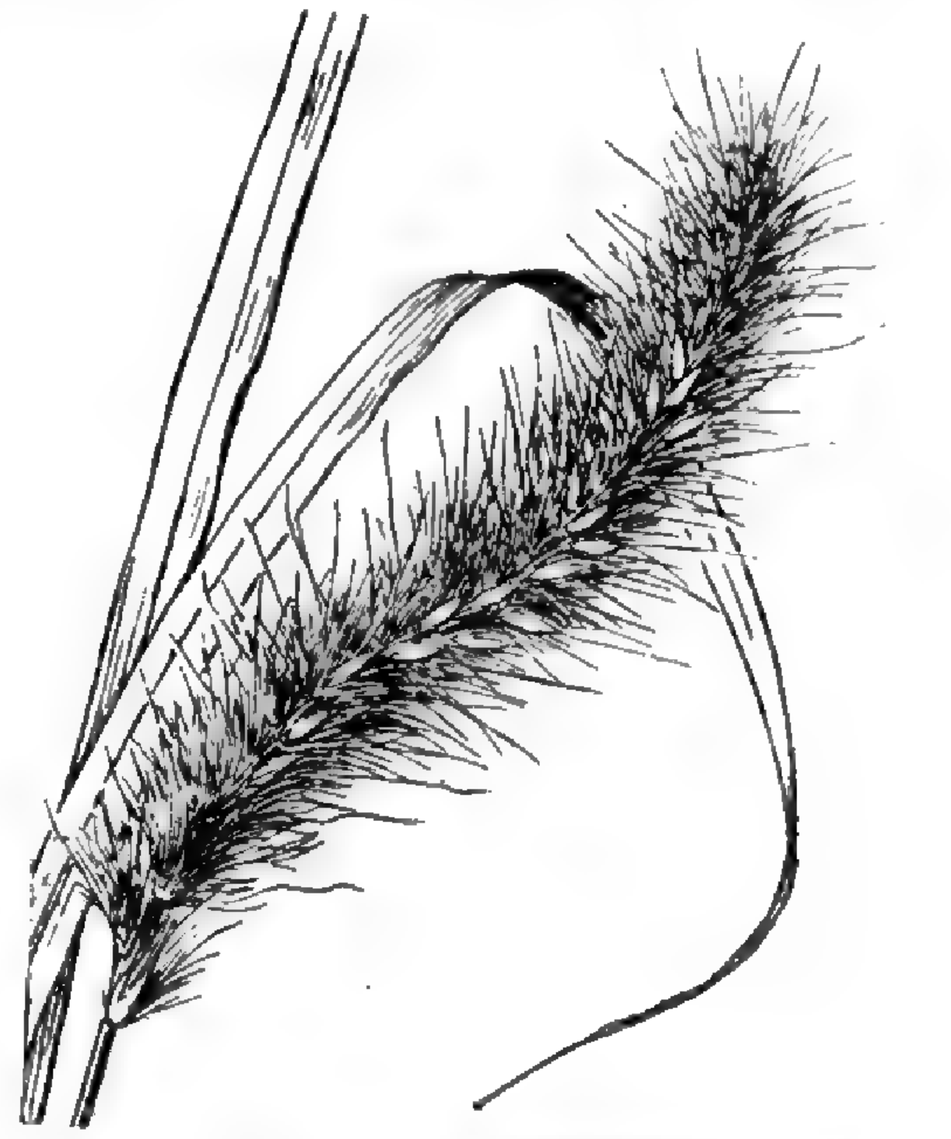

FIG. 71.—*Pennisetum complanatum.* From *Türckheim* 3835, Guatemala.

DISTRIBUTION.

Open, rather dry slopes and savannas from near sea level to 1,500 meters altitude from southern Mexico to Panama.

VERACRUZ: Orizaba, *Bourgeau* 3139; *Hitchcock* 6356; *Mohr* in 1857; *Müller* 2015, *Smith* 625. Papantla, *Liebmann* 344. Mirador, *Schaffner* 185.

GUATEMALA: Cobán, *Türckheim* 81, 445, 3835. Guatemala City, *Hitchcock* 9042, 9043, 9058; *Popenoe* 734. Eureka, *Hitchcock* 9077. Laguna de Ayarza, *Heyde & Lux* 3923. Salida de Izabel, *Seler* 2301. Antigua, *Kellerman* 5112. Lake Amatitlán, *Kellerman* 6248.

SALVADOR: Sonsonate, *Hitchcock* 8973. Izalco, *Pittier* 1901a. Volcano of San Salvador, *Hitchcock* 8943.

PANAMA: El Boquete, *Hitchcock* 8250.

10. Pennisetum domingense (Spreng.) Spreng.

Gymnothrix domingensis Spreng. in Schult. Mant. **2:** 284. 1824. "In S. Domingo. Bertero." The type has not been examined. The description, especially that of the minute involute blades, leaves no doubt of the identity of the species.

Pennisetum domingense Spreng. Syst. Veg. **1:** 302. 1825. "Hispaniol" [Santo Domingo]. The brief description is doubtless drawn from the same Bertero collection, though *Gymnothrix domingensis* is not mentioned. *Cenchrus parviflorus* Poir. is erroneously given as a synonym. That name, as shown by Hitchcock,[43] is a synonym of *Chaetochloa geniculata* (Lam.) Millsp. & Chase.

DESCRIPTION.

Plants glabrous, perennial; culms terete, solid, slender, rigid, glaucous, glabrous, as much as 7 meters tall, branching, the branches borne singly or in fascicles of 2 to 4, about equaling the main culm, stiffly spreading at an angle of about 30 degrees; nodes mostly swollen; sheaths 3 to 5 cm. long, much shorter than the elongate internodes, those subtending the fascicles loose and flat; ligule lacerate-ciliate, about 0.5 mm. long; blades 0.5 to 4 cm. long, 1 to 2 mm. wide, involute, divergent, firm, falling from the sheaths in age; panicles 3 to 5 cm. long, terminal only, erect, loosely flowered, the slender axis angled, scabrous; fascicles on minute pubescent pedicels, ascending or spreading, the scabrous bristles slender, flexuous, unequal, most of them 4 to 10 mm. long, the innermost less slender and 15 to 20 mm. long; spikelet 4.2 to 4.5 mm. long. about 1.4 mm. wide, obscurely strigose; first glume about one-third the length of the spikelet, faintly 3 to 5-nerved, erose; second glume two-thirds as long as the spikelet, 5-nerved, acute; sterile lemma nearly equaling the fertile lemma, 5-nerved, sulcate down the middle, abruptly and minutely mucronate, the palea equaling the lemma and inclosing a well-developed staminate flower; fruit brownish, 4 to 4.2 mm. long, about 1 mm. wide, acuminate, the lemma mucronate.

FIG. 72.—*Pennisetum domingense*. From *Türckheim* 3669, Santo Domingo.

The above description is drawn from a single incomplete specimen, Türckheim's no. 3669. The following note is given by Türckheim on the specimen in the herbarium of the Berlin Botanic Garden [translated]: "Near Maniel de Ocoa, 300 meters altitude; dry ground among shrubs. Only one plant, 7 meters high. October, 1910." The species is apparently very rare.

DISTRIBUTION.

On dry shrubby hillsides, Santo Domingo and eastern Cuba.

CUBA: Eastern Cuba, *Wright* 1547.

SANTO DOMINGO: Maniel de Ocoa, *Türckheim* 3669.

11. Pennisetum durum Beal.

Pennisetum durum Beal, Grasses N. Amer. **2:** 163. 1896. "*P. crinitum* Scribn. ined * * * Mexico, *Pringle* 489, 817." Dr. Beal's work was based on the collections in the herbarium of the Michigan Agricultural College. In this herbarium are two specimens of "*Pennisetum crinitum* Scribn." which are marked "*durum* Beal" in Beal's handwriting. These are Pringle's nos. 498 and 817, both from the state of

[43] Contr. U. S. Nat. Herb. **22:** 168. 1920.

Chihuahua. Since no. 498 is erroneously cited as 489, the second specimen cited, Pringle's no. 817, is taken as the type. This is a single complete culm 1.5 meters tall.

Pennisetum crinitum Scribn.; Beal, Grasses N. Amer. **2:** 163. 1896. Not *Pennisetum crinitum* Spreng. 1825. A herbarium name given as synonym of *P. durum*.

Pennisetum pringlei Leeke, Zeitschr. Naturw. **79:** 33. 1907. "Mexiko." The detailed description identifies the species. No specimen is cited, but from the specific name it is to be supposed that the description was drawn from one of Pringle's three collections of this species, his numbers 498, 817, or 4962.

DESCRIPTION.

Plants perennial; culms few to several from a hard knotted crown, erect, mostly rather robust and rigid, 1.2 to 2 meters tall, usually glaucous, strigose or scabrous on the nodes and just below them, otherwise glabrous, slightly compressed, simple or rarely with a few leafy branches from the upper nodes; sheaths loose, mostly much shorter than the internodes, pubescent on the margin toward the summit and usually on the collar, otherwise glabrous or rarely scaberulous, the scarious margin (especially in the large lower leaves) sometimes produced into an erect auricle at the summit; ligule a ring of stiff hairs 1.5 to 2 mm. long; blades ascending or spreading, mostly rather firm, scabrous and sparsely pilose on both surfaces, or smooth or glabrous beneath, rarely also on the upper surface, 15 to 60 cm. long, 5 to 17 mm. wide, narrowed to the base (often in the lower leaves almost petiole-like) and tapering into a long involute-setaceous scabrous tip; panicles terminal and on slender naked peduncles exserted from the upper 2 to 4 sheaths, 1 to 4 peduncles from a sheath, the panicles nodding, 3 to 10 cm. (rarely 11 to 12 cm.) long, mostly 8 to 10 mm. thick, usually pale, the axis very slender, angled and scabrous; fascicles sessile, ascending; bristles rather scant, unequal, most of them shorter than the spikelet, the innermost longer, sometimes twice the length of the spikelet; spikelet solitary, sessile, 6 to 7 mm. long, about 1.5 mm. wide, acuminate, glabrous; glumes 1 to 3-nerved, acutish, the first about one-third and the second half the length of the spikelet; sterile lemma equaling the fruit or slightly shorter, 5-nerved, acute, its palea obsolete; fruit subindurate, acuminate.

FIG. 73.—*Pennisetum durum*. From type collection.

DISTRIBUTION.

On dry rocky slopes in the highlands of Mexico; apparently rare.
CHIHUAHUA: Santa Eulalia Mountains, *Pringle* 498. Potrero Mountains, *Pringle* 817.
OAXACA: Sierra de San Felipe, *Pringle* 4962; *Conzatti & González* 491.

12. Pennisetum distachyum (Fourn.) Rupr.

Pennisetum distachyum Rupr. Bull. Acad. Sci. Brux. **9²:** 242. 1842. "(Sectio Gymnothrix. Beauv.) (Coll. H. Gal[eotti]. no. 5680.) [Perennial].—Cette espèce remarquable et qui atteint la taille élevée de 15 à 16 pieds, crôit par grosses touffes, comme les Bambusae, dans les ravins sombres et humides de la Barranca de San Martin, près de Zacuapan (État de Vera-Cruz), à 1,500 pieds de hauteur absolue." No further description is given. The name is given by Fournier as a synonym of *Gymnothrix distachya* Fourn.

Gymnothrix distachya Fourn. Mex. Pl. **2:** 48. 1886. "*Pennisetum distachyum* Rupr. in *Bull. Acad. roy. Brux.* ix, n. 8. (nomen)." Fournier cites four specimens, among them that to which Ruprecht gave the name, Galeotti's no. 5680. This specimen, which, since Ruprecht's name is used, must be taken as the type, has not been examined. One of the other specimens cited, Botteri's no. 1214, is represented in the National Herbarium by three specimens, one being the scant-bristled, greenish-panicled form (to which the name *P. distachyum* is here applied) and two being the many bristled, tawny panicled form described below as *P. prolificum*. Botteri's numbers are known to be badly mixed. Little reliance can be placed on citations of his specimens. Fournier's description is unsatisfactory, being mostly a comparison with "*G. tristachya* H. B. K.," which he thinks is but 3 to 4 feet tall, and under which, as shown by the specimens cited, he confused two species, *P. distachyum* and the form with longer purplish bristles and spikelets with staminate lower floret which he described as *Gymnothrix bambusiformis*. But the description of the bristles as not numerous and but little exceeding the spikelet points to the scant-bristled form heretofore called *P. tristachyum* (H. B. K.) Spreng.[44] by American authors.

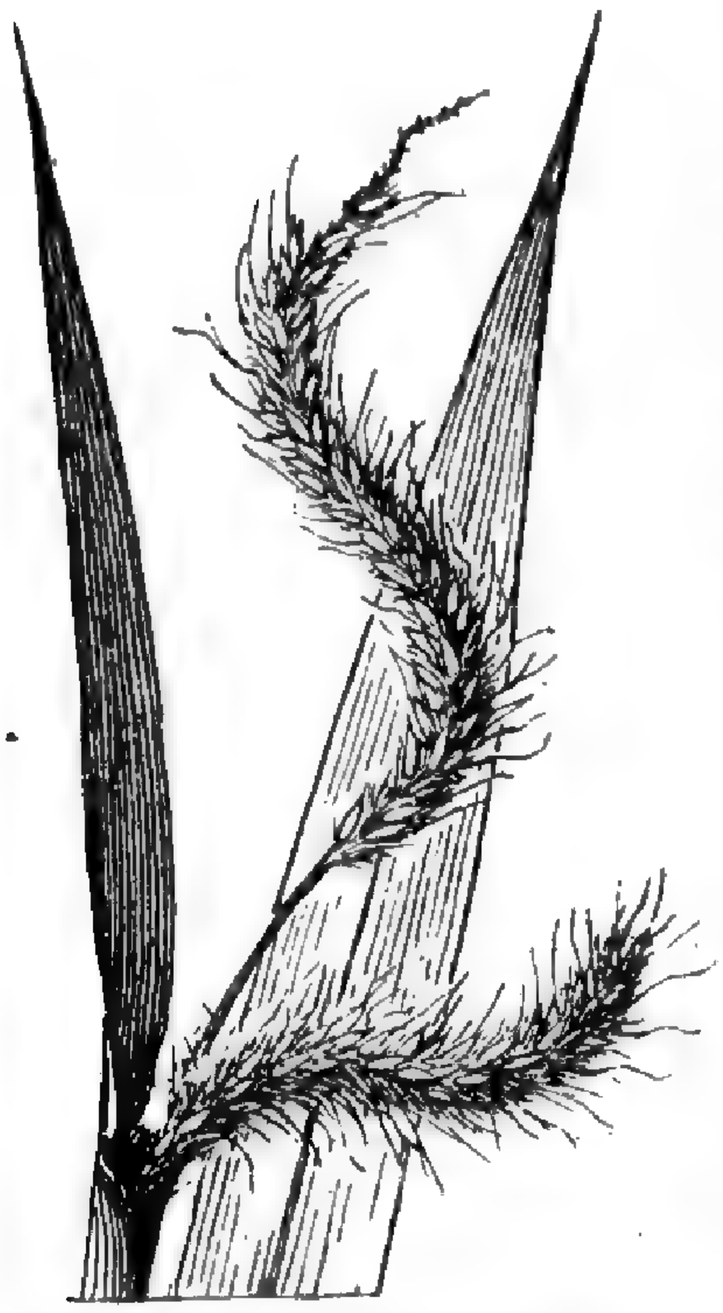

FIG. 74.—*Pennisetum distachyum*. From *Botteri* 96, Mexico.

DESCRIPTION.

Plants perennial; culms 1 to 4 meters tall, robust, glabrous or scabrous below the nodes, mostly solitary, erect or ascending from a decumbent base, often rooting at the geniculate lower nodes, branching from the middle and upper nodes, the primary branches ascending, the secondary and ultimate branchlets spreading or nodding, with 1 to 4 slender-peduncled drooping panicles from each sheath, the whole forming a top-heavy leafy compound inflorescence; nodes appressed-hirsute; sheaths loose, mostly shorter than the internodes, hirsute along the margin and at the summit or glabrate; ligule stiff, lacerate-ciliate, 2 to 3 mm. long; blades flat, mostly spreading, appressed-hirsute on both surfaces or glabrate beneath and sometimes nearly so above, those of the main culm 25 to 45 cm. long, 1.5 to 3.5 cm. wide, narrowed or attenuate at base, the attenuation sometimes elongate, the apex acuminate, but not setaceous-tipped, those of the branches smaller, lanceolate, rounded or slightly narrowed at base; panicles numerous, dull green, terminal and axillary, the slender flexuous scabrous peduncles unequal, the longest often as much as 15 to 20 cm. long, one of the cluster of panicles usually partly included, the panicles rather densely flowered, 3 to 8 cm. long, rarely 10 cm. long, about 1 cm. wide, excluding the longest bristles, usually tapering to the apex, the longer ones flexuous, the axis slender, angled,

[44] This species based on *Gymnothrix tristachya* H. B. K. (Nov. Gen. & Sp. **1:** 113. 1816), described from Ecuador, has less freely branching culms, longer and narrower blades, longer panicles, longer bristles, and larger spikelets. The locality cited with the original description is "prope Puembo * * * regni Quitensis." Mr. Gagnepain, of the Paris Herbarium, states that the Puembo specimen is very poor, but that a specimen from Quito, a panicle and part of a branch of which were kindly sent to the National Herbarium, agrees perfectly with the type. Specimens from Ecuador and Peru agree exactly with this and with the original description and the illustration published later (H. B. K. Nov. Gen. & Sp. **7:** *pl. 679.* 1825). Other specimens commonly referred to *P. tristachyum* belong to various allied species.

scabrous; fascicles on minute pubescent peduncles, ascending; bristles slender, scant (mostly less than 20), unequal, most of them shorter than the spikelet or but little exceeding it, the innermost about twice as long as the spikelet; spikelets 4.5 to 5.5 mm. long, 1 to 1.2 mm. wide, acuminate; glumes unequal, obscurely ciliolate, the first minute, 1-nerved, acute or obtuse, the second about one-third to nearly half the length of the spikelet, 3-nerved, acute or subacute; sterile lemma slightly exceeding the fertile lemma. 5-nerved, depressed down the middle, scabrous, especially toward the summit, acuminate, the palea wanting; fruit acuminate, but little indurate, the lemma 5-nerved and scabrous toward the summit, the margins thin and flat.

This species is very closely related to *Pennisetum latifolium* Spreng. of the Atlantic slope of South America from Brazil to Uruguay. That, like *P. distachyum*, has been referred to *P. tristachyum*. The illustration given by Doell.[45] as *Gymnothrix tristachya* H. B. K. represents *P. latifolium*. In that species, described from Montevideo, the blades are on the average longer for their width than in *P. distachyum*, the panicles are mostly longer and yellowish, and the bristles longer, the innermost one three to four times the length of the spikelet.

DISTRIBUTION.

In moist ground, in ravines and along stream borders and irrigation ditches, in the uplands from southern Mexico to Costa Rica.

VERACRUZ: Zacuapan, *Purpus* 2894. Mirador, *Liebmann* 339. Orizaba, *Botteri* 96, 631, 1209, 1214 in part; *Bourgeau* 2543; *Müller* 2066; *Seaton* 291. Córdoba, *Bourgeau* 1664.

OAXACA: Cuicatlán, *Pringle* 5558, 5559.

GUATEMALA: Baja Verapaz, *Türckheim* 3880.

COSTA RICA: San Francisco de Guadalupe, *Jiménez* 2; *Tonduz* 8020, 14064. San José, *Hitchcock* 8448. San Ramón, *Tonduz* 17910.

13. Pennisetum prolificum Chase, sp. nov.

Plants perennial; culms 2 to 4 meters tall (probably taller, the base not seen), very robust, glabrous, branching from the upper nodes, the branches often in fascicles of 2 to several, relatively slender, repeatedly fasciculately branching, the ultimate branchlets very slender, nodding, their nodes often strongly geniculate, the very numerous panicles 2 to 5 together on very slender, flexuous, usually glabrous peduncles, mostly 2 to 10 cm. long, the terminal panicle often solitary, the whole system of branches forming a great drooping leafy compound tawny inflorescence often 1 meter or more long and probably nearly as wide; nodes glabrous or strigose; sheaths loose, glabrous or ciliate on the margin above, sometimes with a few long soft hairs at the summit; ligule stiff, lacerate-ciliate, about 2 mm. long; blades flat, mostly spreading, 15 to 50 cm. long, 2 to 4 cm. wide (on the average a little shorter and broader than those of *P. distachyum*), narrowed but not long-attenuate at base, glabrous on both surfaces or slightly scabrous above, those of the branches progressively smaller, the ultimate ones much more reduced than those of *P. distachyum*; peduncles unequal, one panicle of a fascicle partly included; panicles tawny, 3 to 5 cm. long, about 1 cm. wide,

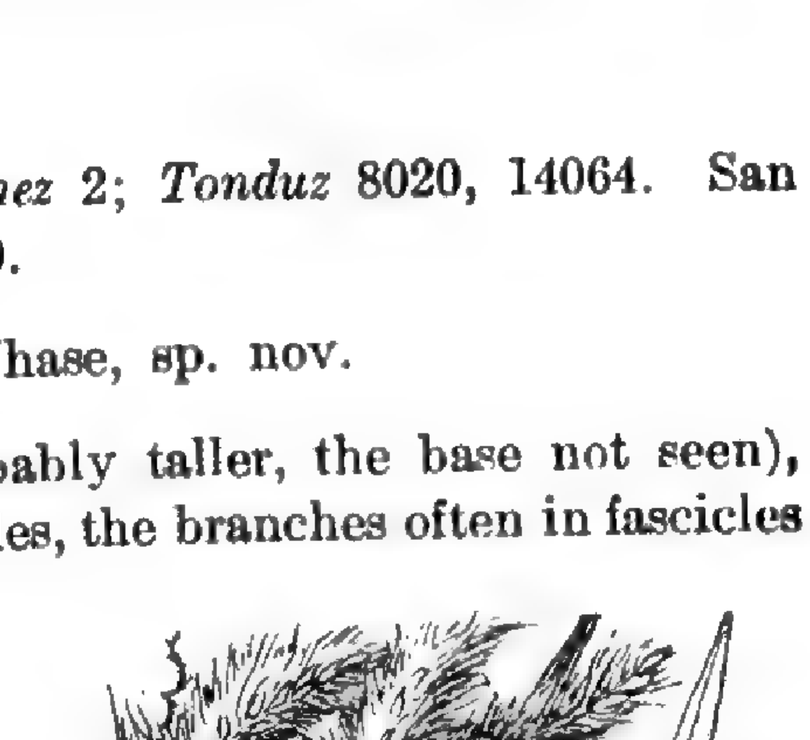

FIG. 75.—*Pennisetum prolificum*. From type specimen.

[45] In Mart. Fl. Bras. 2²: *pl. 41*. 1877.

denser than in *P. distachyum*, slightly tapering or obtuse at the apex, the slender angled axis minutely scabrous; fascicles nearly sessile, somewhat spreading; bristles slender, numerous, more spreading than in *P. distachyum*, most of them exceeding the spikelet, the innermost not conspicuously longer than the rest; spikelet similar to that of *P. distachyum*, but minutely scabrous only or glabrous, the glumes thinner, more obtuse, the first usually nerveless, often erose; sterile palea wanting; fruit scarcely indurate (thinner than in *P. distachyum*).

Type in the U. S. National Herbarium, no. 250836, collected on rocky slopes, barranca of Metlac, altitude about 900 meters, State of Veracruz, Mexico, January 29, 1895, by C. G. Pringle (no. 6075; distributed as *Pennisetum bambusiforme* Hemsl.)

None of the specimens seen shows the base of the plant. This species has been confused with *P. bambusiforme*, from which it differs in its smooth or nearly smooth blades, denser inflorescence, much shorter and more densely flowered, tawny panicles, somewhat shorter bristles, less unequal in length, and in the absence of the sterile palea.

DISTRIBUTION.

Rocky slopes, uplands of southern Mexico.

VERACRUZ: Orizaba, *Botteri* 1214; *Mohr & Botteri* in 1856. Barranca of Metlac, *Pringle* 6075.

GUERRERO: Sierra Madre, *Langlassé* 849.

OAXACA: Plunia, *Nelson* 2484.

14. Pennisetum bambusiforme (Fourn.) Hemsl.

Gymnothrix bambusiformis Fourn. Mex. Pl. **2**: 48. 1886. "Prope *Mirador* (SCHAFFN. n. 338)" is the only specimen cited. The name was earlier listed without description by Hemsley.[46] Schaffner's no. 338 has not been examined. It seems possible that "Schaffn." may be an error. Liebmann's no. 338 is from Mirador, and the specimens of this collection distributed from the Copenhagen Herbarium are labeled "*Gymnothrix bambusaeformis* Fourn. determ. Fournier," and agree perfectly with Fournier's description. Fournier, however, cites Liebmann's no. 338 under "*G. tristachya* H. B. K." As stated above (under *Pennisetum distachyum*), Fournier's idea of that species was confused. His description of *G. bambusiformis* is fairly detailed. The characters that point most certainly to the identification here made of *G. bambusiformis* are [translated]: "Bristles unequal, of which one is constantly longer, most of them twice the length of the spikelets," and "neuter floret 2-paleate." In the species described above as *Pennisetum prolificum*, which has been confused with *P. bambusiforme*, the bristles are not very unequal, the innermost one scarcely noticeably longer (most of them are about once and a half the length of the spikelet), and the lower floret is empty.

Pennisetum bambusiforme Hemsl. Biol. Centr. Amer. Bot. **3**: 507. 1885, nom. nud.; Ind. Kew. **2**: 458. 1894. Based on *Gymnothrix bambusiformis* Fourn.

Pennisetum tristachyon var. *bambusiforme* Leeke, Zeitschr. Naturw. **79**: 33. 1907. Based on *Gymnothrix bambusiformis* Fourn.

Pennisetum tristachyum var. *galeottianum* Leeke, Zeitschr. Naturw. **79**: 33. 1907. "Mexiko." Leeke places the various allies of *P. tristachyum* under that species as varieties. His var. *bambusiforme* is based on *Gymnothrix bambusiformis*, hence the name is a synonym of *P. bambusiforme*; but it is uncertain to which of the forms Leeke applies the name. He includes *Gymnothrix distachya* Fourn. as a synonym, but in his brief diagnosis says "Culmi nodi glabri." In *P. distachyum* the nodes are appressed-hirsute; in *P. bambusiforme* and *P. prolificum* they are glabrous or strigose. The diagnosis of var. *galeottianum* is: "Culmi nodi pilosi; spiculae 4–4.5 mm. longae." In Galeotti's no. 5871 (*P. bambusiforme*) the lower nodes present are strigose but the

[46] Biol. Centr. Amer. Bot. **3**: 507. 1885.

spikelets are 5 mm. or more long. A specimen of that collection in the herbarium at Vienna is labeled "*Pennisetum tristachyum* var. *Galeottianum* Leeke, n. var." and is probably the type. Galeotti's no 5871 differs from other specimens of *P. bambusiforme* in that the sterile floret is empty in about half the spikelets examined. Otherwise the specimen has the characters of this species.

DESCRIPTION.

Plants perennial, the culms very robust, probably as much as 6 meters tall (the base not seen), glabrous, branching from the upper nodes, the branches often in fascicles of 2 or 3 (on the average less numerous than in *P. prolificum*, slender, repeatedly branching, the whole forming a drooping compound leafy inflorescence, looser and less massive than in *P. prolificum;* nodes glabrous, rarely appressed-pubescent; sheaths loose, ciliate on the margin and with an erect tuft of white hairs at the summit (old sheaths commonly glabrescent), the sheaths of the inflorescence on the average longer than in *P. prolificum* and somewhat inflated; ligule lacerate-ciliate, about 2 mm. long; blades flat, rather firmer than in the two preceding species, ascending or spreading, those of the main culm 20 to 35 cm. long, 2 to 3.5 cm. wide, narrowed, sometimes somewhat attenuate at base, scabrous or appressed-pubescent on the upper surface, softly appressed-pubescent beneath, sometimes glabrescent, the blades of the ultimate branchlets narrow, much reduced; peduncles slender, scaberuous, flexuous, unequal, one panicle of the fascicle partly included; panicles purplish tawny, 5 to 12 cm. long (rarely longer), about 1 cm. wide, excluding the longest bristles, loose, flexuous, tapering at the apex, the slender angled axis scabrous or hispidulous; fascicles on minute pedicels, not crowded, ascending; bristles slender, flexuous, numerous, very unequal, most of them about twice the length of the spikelet, the innermost sometimes as much as 2 cm. long; spikelets 5 to 6 mm. long, 1 to 1.2 mm. wide, scabrous; glumes unequal, the first minute, usually nerveless, obtuse or erose, the second one-fourth to one-third the length of the spikelet, 1 to 3-nerved, acute or erose; sterile lemma exceeding the fertile lemma, 5 to 7-nerved, attenuate into a slender flexuous tip, inclosing a well-developed palea and usually a staminate flower; fruit 4.5 to 5 mm. long, the lemma scabrous toward the acuminate apex, but slightly indurate.

FIG. 76.—*Pennisetum bambusiforme.* From *Jiménez* 990, Costa Rica.

DISTRIBUTION.

On rocky slopes and cliffs, between 900 and 2,800 meters altitude, southern Mexico to Peru.

VERACRUZ: Mirador, *Liebmann* 338. Petlapa,[47] *Liebmann* 340.

OAXACA: Comaltepec, *Galeotti* 5871.

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[47] We are unable to locate this station, but most of Liebmann's collections were made in Veracruz. It may be in Oaxaca.

GUATEMALA: Pansamalá, *J. D. Smith* 1853; *Türckheim* 34. Cobán, *Türckheim* II.2136, II. 2183. El Palmar, *Kellerman* 6262. Volcán Atitlán, *Kellerman* 5781. Volcán del Fuego, *Seler* 2422.

COSTA RICA: Rancho Redondo (Goicoechea), *Jiménez* 990. "Cabeceras del Bkis," *Pittier* 10573.

COLOMBIA: Bogotá, *Apollinaire & Arthur* 12.

PERU: Santa Ana, *Cook & Gilbert* 1632.

EXCLUDED SPECIES.

The following names at some time included in *Pennisetum* comprise only those based on species found in America:

Pennisetum corrugatum (Ell.) Nutt.=*Chaetochloa corrugata* (Ell.) Scribn.

Pennisetum crusgalli (L.) Baumg.=*Echinochloa crusgalli* (L.) Beauv.

Pennisetum geniculatum (Lam.) Jacq.=*Chaetochloa geniculata* (Lam.) Millsp. & Chase.

Pennisetum germanicum (Beauv.) Baumg.=*Chaetochloa italica germanica* (Mill.) Scribn.

Pennisetum italicum (L.) R. Br.=*Chaetochloa italica* (L.) Scribn.

Pennisetum laevigatum (Muhl.) Nutt.=*Chaetochloa geniculata* (Lam.) Millsp. & Chase

Pennisetum montanum (Griseb.) Hack.=*Hymenachne montana* Griseb.

Pennisetum myosuroides (H. B. K.) Spreng.=*Cenchrus myosuroides* H. B. K.

Pennisetum pungens Nutt.=*Cenchrus myosuroides* H. B. K.

Pennisetum scandens (Schrad.) Jacq.=*Chaetochloa scandens* (Schrad.) Scribn.

Pennisetum verticillatum (L.) R. Br.=*Chaetochloa verticillata* (L.) Scribn.

Pennisetum viride (L.) R. Br.=*Chaetochloa viridis* (L.) Scribn.

INDEX.

[Page numbers of principal entries in heavy-face type. Synonyms in italic.]

Page.

African millet 218
Alopecurus *indicus* 210, 222
Amphochaeta 211
exaltata 211
Beckera *nubica* 211
petiolaris 211
Beckeropsis 210, 211, 212
nubica 211
petiolaris 211
Cataterophora 211
Catatherophora 211
hordeiformis 211
Cat-tail millet 218
Cenchrus 209, 210, 212
ciliaris 215
multiflorus 219, 220
myosuroides 212, 234
parviflorus 228
pilosus 219
setosus 220
spicatus 216
villosus 213
Chamaeraphis 209
glauca 217
Chaetochloa 209
corrugata 234
geniculata 228, 234
glauca 216, 217
italica 218, 234
germanica 234
lutescens 216, 217
scandens 234
verticillata 234
viridis 216, 234
vulpiseta 222
Echinochloa crusgalli 234
Elephant grass 218
Elytrophorus articulatus 216
Eriochaeta 210, 211
densiflora 211
reversa 211
secundiflora 211
Fountain grass 214
Foxtail 216
Gymnothrix 210, 211, 214
bambusiformis 230, 232
complanata 226
crinita 225
distachya 229, 230, 232
domingensis 228
geniculata 221, 222
grisebachiana 227
mexicana 226, 227
thuarii 210
tristachya 230, 231, 232
Himalaya grass 215

Page

Holcus 216
spicatus 210, 216, 217
Hymenachne montana 212, 234
Imperata caudata 223
Indian millet 218
Ixophorus *glaucus* 217
Macrochaeta 211
sacchariformis 211
Millet, pearl 209, 216, 218
Napier grass 218
Negerhirse 209
Odontelytrum 209
Paniceae 209
Panicum *alopecuroides* 222
alopecurus 224
americanum 218
antillarum 225
cenchroides 220, 221
densispica 221
glaucum 216, 217
hordeiforme 211
polystachyion 222
triticoides 221
vulpisetum 222
Paratheria 209
Pearl millet 209, 216, 218
Penicillaria 209, 210
ciliata 210
plukeneti 217
spicata 210, 216, 217
Pennisetum 209, **210**, 211, 212
alopecuroides 221
alopecuros 224
americanum 209, 218
antillarum 210, **225**
bambusiforme **232**, 233
breve 224
cenchroides 210, 215, 216
ciliare 212, **215**, 216
complanatum **226**, 227
compressum 222
corrugatum 234
crinitum **225**, 226, 228, 229
crusgalli 234
dasistachyum 221
distachyum **229**, 230, 231, 232
domingense 228
durum 212, **228**, 229
erubescens 221
exaltatum 210, 212
flavescens 221
geniculatum 234
germanicum 234
glaucum 209, 210, 212, **216**, 217, 218
gymnothrix 218
hamiltonii 222

	Page.
Pennisetum *hirsutum*	221
holcoides	216
hordeiforme	211
humboldtianum	225
indicum	209, 210, 222
var. *purpurascens*	222
var. *typica*	222
italicum	234
karwinskyi	210, 212, 219, 220
laevigatum	234
latifolium	231
longistylum	214
macrophyllum atropurpureum	214
macrostachyum	209, 211, 214
mexicanum	227
mollissimum	218
montanum	234
multiflorum	209, 219, 220
mutilatum	210, 212
myosuroides	234
nicaraguense	222
orientale	210
triflorum	214, 215
pallidum	221
pentastachyum	211
perottetii	218
polystachyum	209, 222
pringlei	229
prolificum	230, 231, 232, 233
pungens	234
purpurascens	221, 222
Pennisetum purpureum	209, 218
richardi	221
ruppelii	209, 214
scandens	234
setosum	209, 210, 220, 221, 222, 223, 224, 225
sieberi	221
spicatum	217
triflorum	214
tristachyum	230, 231, 232
var. *bambusiforme*	232
var. *galeottianum*	232, 233
triticoides	221
typhoideum	210
uniflorum	221
versicolor	218
verticillatum	234
villosum	213, 214
var. *humile*	213
violaceum	210, 218
viride	234
Pentastachya	211
abyssinica	211
Plagiosetum	209
Saccharum antillarum	225
Sericura	211
elegans	211
Setaria antillarum	225
cenchroides	221
flava	222
geniculata	221, 222
glauca	216, 217

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11

PREFACE.

Among the many thousands of persons who visit the national parks each year a large number are deeply interested in the plant life, including not only the wealth of conspicuous flowering plants but the trees of the forest also. All the national parks offer exceptional opportunity for the study and enjoyment of primeval vegetation, and in this respect none of them perhaps is better provided with attractive and refreshing material than Glacier National Park, Montana. The present paper has been written for the purpose of enabling visitors to this park to become more familiar with its wild plants and to derive greater enjoyment from them. This publication will be useful not only in Glacier Park but elsewhere in the mountains of Idaho, Alberta, and British Columbia. Most of the common plants of Yellowstone National Park occur also in Glacier Park. The present flora will be found helpful therefore to travelers in the Yellowstone region.

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CONTENTS.

	Page.
Introduction	235
General features of the flora	236
Life zones	238
Transition Zone	239
Canadian Zone	241
Hudsonian Zone	245
Arctic-Alpine Zone	247
Scope and plan of the flora	249
Earlier botanical exploration	251
Acknowledgments	253
Bibliography	253
Systematic treatment	255
Key to the families	255
Annotated catalogue of species	263
Index	IX

ILLUSTRATIONS.

PLATES.

Following page.

PLATE 33. View south from the Garden Wall, showing the mountains of the west slope 438
34. View southeast from Iceberg Lake 438
35. Swiftcurrent Valley 438
36. Pond near Swiftcurrent Creek below Lake McDermott 438
37. View from a point near Granite Park; Heavens Peak at the right . . 438
38. A. Limber pine (*Pinus flexilis*) on Altyn Peak. B. Dense forest of hemlock and giant cedar near Lake McDonald 438
39. Mountain side below Sperry Chalets 438
40. A. Shore of Lake McDonald. B. Sphagnum bog at Johns Lake . . 438
41. View on the trail to Piegan Pass 438
42. A. Dwarfed trees at Swiftcurrent Pass. B. Meadow near Granite Park 438
43. Ptarmigan Lake 438
44. A. Lake Ellen Wilson and Gunsight Pass. B. An Arctic-Alpine rock slide 438
45. A. Fir clubmoss (*Lycopodium selago*). B. Stiff clubmoss (*Lycopodium annotinum*) 438
46. A. Running-pine (*Lycopodium clavatum*). B. Queencup (*Clintonia uniflora*) 438
47. A. Western yew (*Taxus brevifolia*). B. Ladies'-tresses (*Ibidium romanzoffianum*) 438
48. A. Purple clematis (*Clematis columbiana*). B. White dryad (*Dryas octopetala*) 438
49. A. Alpine bistort (*Polygonum viviparum*). B. Spiny currant (*Ribes lacustre*) 438
50. A. Red raspberry (*Rubus strigosus*). B. Blue phacelia (*Phacelia lyallii*) 438
51. A. Canada buffaloberry (*Lepargyrea canadensis*). B. Cow parsnip (*Heracleum lanatum*) 438
52. A. Rough aster (*Aster conspicuus*). B. Showy fleabane (*Erigeron salsuginosus*) 438

FLORA OF GLACIER NATIONAL PARK, MONTANA.

By Paul C. Standley.

INTRODUCTION.

Glacier National Park lies in northwestern Montana along the main range of the Rockies. It embraces an area of 1,534 square miles, nearly all of which consists of masses of high mountains. On the north it adjoins British Columbia and Alberta; eastward stretch the prairies of the Blackfoot Indian Reservation, and to the west lie the mountains and heavy forests of the Flathead Valley. The Continental Divide runs along the crest of the chief mountain ridge. The drainage of the west (Pacific) slope of the park is consequently into the Columbia River, while on the east (Atlantic) slope it is partly to Hudson Bay and partly to the Missouri River. From one point, Triple Divide Peak, the drainage is partly into each of the three systems. The highest peaks of the region reach an altitude of but little more than 3,000 meters (10,000 feet), but the elevation of the surrounding country is comparatively low (950 meters on the west slope and 1,440 meters on the east slope), so that the mountains are quite as imposing in appearance as many of those in the southern Rockies which have a much greater elevation.

The rocks of the park are stratified and of Algonkian age. They consist chiefly of shale, limestone, sandstone, and argillite, their prevailing colors being rich reds and dull greens. In many places the stratification is very regular and certain strata can be traced with the eye for many miles, but in other places the strata are folded and contorted in an interesting fashion. Besides the stratified rocks, a conspicuous feature is an intrusion of diorite—an igneous rock—which can be followed for a long distance along the Garden Wall as a well-marked band of black.

The whole region of the park is extremely rugged (see plate 33), the mountains usually having sharp summits and precipitous sides. The main ridge is broken only infrequently by passes, whose altitudes range from 1,800 to about 2,100 meters. The slopes of the mountain masses have been plowed by ancient glaciers, and numerous lateral valleys have been cut, along which streams now run. In many of the valleys lie large or small lakes whose waters are wonderfully transparent and beautifully colored in blue or green. Fed directly by

streams from the snow fields and present glaciers, the water of these lakes is ice cold. High up on the peaks, in glacier basins, are often found miniature jewel-like lakes of intense colors, frequently surrounded by the ice walls of the glaciers themselves. Most spectacular of them is Iceberg Lake, on the east slope, which all summer long is full of huge blocks of floating ice which have broken off from the overhanging glacier. In some of these small alpine lakes the water is milky white from the particles of rock, finely ground by glaciers, held in suspension.

One of the most striking features of the park is found in the glaciers which have given it its name. These lie in depressions at the head of some valley or hang high up on steep rock slopes. None of them are very large—Blackfoot Glacier is about three miles wide—but there are over 60 of them in the park. Each one possesses all or most of the features of the largest glaciers, and in a small glacier one can see the processes of glacial action much more readily than in a large one. Streams of water flow away from each of these ice masses, often falling abruptly over high cliffs, carrying down chunks of ice and rock which are heard constantly crashing upon the rocks below. The streams themselves, which abound everywhere in the park, are one of its many attractive features.

To most people another source of interest is the profusion of animal life.[1] Deer, elk, moose, mountain sheep and goats, bears, and many smaller animals are found in varying abundance. Sheep and goats are particularly plentiful and may be seen by the visitor in any of the higher regions, sometimes even in the vicinity of the hotels and chalets. The streams and lakes are well stocked with trout and other fishes.

The winters are long in northern Montana. Snow falls by middle September or even earlier; indeed, at high altitudes, it frequently falls even in midsummer. At low elevations it remains until late in the season. In 1919, although the snowfall had been extremely light the previous winter, numerous snow banks remained at middle or even at low altitudes the first of July. Because of the short summers, the tourist season is limited; it extends from June 15 to September 15.

GENERAL FEATURES OF THE FLORA.

All the national parks of the West possess many attractions for anyone interested in plants, whether from the esthetic or from the scientific standpoint, and for the study of plants none offers greater advantages than Glacier Park. The flora is rich in number of species, and the vegetation is luxuriantly developed. All through

[1] See Wild animals of Glacier Park: The mammals, by Vernon Bailey; The birds, by Florence Merriam Bailey. Department of the Interior, National Park Service. 1918.

the summer there is a lavish display of color, which attains its climax about the first of July. The flowers follow close upon the retreating snow banks, and thus even when they are somewhat faded at lower altitudes they may be seen in all their vernal freshness on the high slopes. The growing season is so brief that plants must bloom and fruit quickly. At high altitudes, and to some extent at middle ones, there are no "spring," "summer," or "fall" flowers, for nearly all plants are in bloom at once, asters and goldenrod mingling with violets, springbeauties, and anemones. At low altitudes, however, there are marked differences between the spring and autumn floras.

The flora of Glacier Park is in general typical of the Rocky Mountain region, but like that of any restricted area it shows certain special characteristics. The Continental Divide, which traverses the park, is to a certain extent a barrier to plant migration, and there are noticeable differences between the plants of the east and west slopes. The differences are most conspicuous in the case of the trees, and will be discussed in detail further on. In general, the flora of the east slope is like that of the central Rockies, while the flora of the west slope shows a marked relationship to that of the northern Pacific coast. It is noteworthy that a large number of coastal species reach the eastern limit of their range (in the United States at least) in Glacier Park. Many characteristic plants of the mountains of Alberta and British Columbia reach their southern limit in this region, and several such plants collected in Glacier Park have not been found elsewhere in the United States. Of course, more thorough exploration of the mountains of western Montana may show that some of these have a wider range than is known at the present time.

The forests of the park are of chief interest to those who come from the East. Like all western forests, they are composed almost wholly of coniferous trees belonging to a comparatively small number of species. The only broad-leafed tree which occurs in much abundance is the aspen. The forests of the east slope are only moderately heavy, but those of the west slope, especially about Lake McDonald, are very dense and are composed of large trees. The forests of the west slope are similar to those of the Pacific coast, although they are not so extensive or luxuriant.

Since there is practically no cultivated land inside the park, few introduced plants are to be expected, and in the present list there are included only 61 species of foreign origin. Most of these have been found only about Belton and the east entrance, where they have become established along the railroad. A few foreign plants are thoroughly naturalized in the park, however, and some are abundant, such as timothy, sheep sorrel, fanweed, red, white, and alsike clover,

and the common thistle (*Cirsium lanceolatum*). None of these, with the possible exception of the thistle on the west slope, is sufficiently plentiful to constitute a prominent element of the flora.

LIFE ZONES.

In the study of the vegetation of any region it soon becomes apparent that many of the species are restricted in their distribution. Some plants, of course, grow only in water or in wet soil, and others only in dry or well-drained situations, but most species are not generally distributed even when such habitats are disregarded. In the mountains, as one ascends the slopes, it is noted that the character of the vegetation changes, either gradually or abruptly, certain plants disappearing and new ones taking their places. Very few plants that grow on mountain tops grow also in the foothills or valleys or on the plains. In general, it is found that the vegetation is divided roughly into belts or zones, which are sometimes well marked, but often of indefinite limitation. As a general rule the trees and shrubs are more definitely distributed in belts than are the herbaceous plants. This zonal distribution of plants is the result of varying conditions with regard to temperature and moisture, as influenced by exposure and elevation. Moisture and especially temperature vary greatly at different elevations, and each plant reaches its best development at the elevation at which conditions are most fully suited to its growth.

After studying the broader aspects of the distribution of plants and animals, botanists and zoologists have evolved a general classification of regions into life zones, each of which occupies a wide geographic area. For North America these zones have been worked out with great care, and a knowledge of the characteristics of each is desirable in the study of the flora of any region, especially a mountainous one. In regions of little variation in elevation a single zone often continues without interruption for hundreds of miles, but in the Rocky Mountains one may often pass through three or four different zones in a half day's walk.

The life zones, of course, are not always sharply marked; indeed, more often they are not, but their general features can usually be recognized, and the more familiar one becomes with a certain region the more apparent are the broader features of the zonal division. If temperature and moisture were uniform at a given altitude, probably the so-called zones would be sharply marked, but this is obviously not the case. On northward slopes there is less evaporation and consequently more moisture, and also the temperature is somewhat lower at a given altitude than on a sunny slope; on a southward slope the conditions vary in the opposite direction. As a consequence, plants of high altitudes are often found at compara-

tively low elevations on northward slopes, and plants of low altitudes at high elevations on sunny slopes. In Glacier Park the snow banks remain on northward slopes all through the summer at rather low elevations, and about them one finds many plants which are characteristic of alpine meadows. On exposed southward slopes above timber line one often comes unexpectedly upon plants which ordinarily grow far below upon the plains or foothills.

The greater number of the plant species, except those which grow upon the prairie or the highest summits and rock slides, range through two zones, but some are more widely dispersed, and a few are found nearly everywhere. The following list includes those species which are found at almost all altitudes, the zone names in parentheses indicating the region in which each is most abundant, if it is noticeably more abundant anywhere:

Zygadenus elegans (Hudsonian).
Allium cernuum (Canadian).
Erythronium grandiflorum (Hudsonian).
Ranunculus reptans (Canadian).
Parnassia fimbriata (Hudsonian).
Saxifraga bronchialis.
Heuchera glabella.
Potentilla fruticosa (Hudsonian).
Astragalus alpinus (Arctic-Alpine).
Hedysarum sulphurescens (Hudsonian).
Linum lewisii.
Epilobium latifolium (Hudsonian, Arctic-Alpine).
Dodecatheon pauciflorum (Hudsonian).
Galium boreale.
Campanula rotundifolia.
Aster meritus (Hudsonian, Arctic-Alpine).
Achillea lanulosa.
Gaillardia aristata (Transition).

It will be noticed that these are all herbaceous plants, and only a few of them are divided by any author into two or more species.

The life zones represented in Glacier Park [2] are four—Transition, Canadian, Hudsonian, and Arctic-Alpine (see plate 34). These are discussed below.

TRANSITION ZONE.

On the east slope of the park this zone is well represented, for it includes all the plains, part of the foothills, and the low valleys (see plate 35), and in warmer, exposed places it extends up to an altitude of about 1,350 meters. In this part of the Rockies the Transi-

[2] A map showing the distribution of the life zones in the park is included in the "Wild Animals of Glacier Park," by Vernon Bailey.

tion Zone is typically a plains belt, but in the southern Rockies it usually occupies the middle slopes of the mountains, at much greater altitudes. On the west slope of the park it is poorly represented; there are traces of it about Belton, as indicated by the presence of yellow pine and western red cedar, together with a few characteristic herbaceous species. Along the North Fork of the Flathead, on the west boundary of the park, the yellow pines are said to be more abundant, and the Transition Zone better developed. This latter area was not visited by the writer.

The only trees characteristic of the Transition Zone are the yellow pine and red cedar, and these are not present on the east slope. The common shrubs are the creeping cedar, water birch, white clematis, bush cinquefoil, wild rose (*Rosa bourgeauviana*), chokecherry, serviceberry, silverberry, a snowberry (*Symphoricarpos occidentalis*), and sagebrush. Of these, the creeping cedar, bush cinquefoil, chokecherry, and serviceberry extend also into the Canadian Zone. The following list includes the more common and characteristic herbaceous plants. Those marked with an asterisk extend also into the Canadian Zone.

Typha latifolia.
Sagittaria cuneata.
Alisma brevipes.
Distichlis spicata.
Agropyron smithii.
Allium nuttallii.
Iris missouriensis.
Comandra pallida.
Rumex mexicanus.
Dondia depressa.
Atriplex hastata.
Chenopodium humile.
Chenopodium salinum.
Pulsatilla ludoviciana.
Halerpestes cymbalaria.
Physaria didymocarpa.
Lesquerella spathulata.
Potentilla anserina.
Potentilla pennsylvanica *
Potentilla hippiana.
Thermopsis rhombifolia
*Lupinus tenellus.**
Astragalus miser.
Astragalus goniatus.
Astragalus drummondii
Astragalus carolinianus
Oxytropis deflexa.
*Oxytropis gracilis.**
Oxytropis splendens.
Mentzelia dispersa.
Gaura coccinea.
Taraxia breviflora.
Pachylophus caespitosus.
Hippuris vulgaris.
Zizia cordata.
Bupleurum americanum.
Gentiana affinis.
Navarretia minima.
Lithospermum ruderale.
Allocarya californica.
Oreocarya glomerata.
Pentstemon nitidus.
Orthocarpus luteus.
Pyrrocoma lanceolata.
Grindelia perennis.
Aster campestris.
Aster crassulus.
Erigeron caespitosus.
Helianthus subrhomboideus.
Artemisia frigida.
Artemisia biennis.
Madia glomerata.
*Gaillardia aristata.**
Arnica foliosa.
Cirsium undulatum.

The Transition Zone is moderately well differentiated from the Canadian, but there are certain complications. The prairie, of course, is purely Transition, but in the foothills and low valleys it is often impossible to tell whether a given area is more typically Transition or Canadian. The lower open slopes are usually without any Canadian intrusion, but on the higher rocky slopes, like those of Altyn Peak, plants of the two zones are intermingled. In fact, about snow banks upon such slopes Arctic-Alpine plants grow in close proximity with Transition ones. Sometimes patches of apparently Transition vegetation occur at high altitudes, as at Cracker Lake. On the other hand, Canadian vegetation, characterized by a heavy growth of trees, often extends to low altitudes, especially along streams.

The species of the Transition Zone are mostly ones which are characteristic of wide areas of the Great Plains. Many of them extend eastward to Minnesota and southward to Texas. The species of this zone are most easily studied at the east entrance, at St. Mary, and just below Lake McDermott.

The most interesting portion of the zone, as represented in the Glacier Park region, is found on the prairie about the east entrance. The plains here are broken by deep canyons, with precipitous banks composed of crumbling shale. Several of these canyons are within a few minutes' walk of the Glacier Park Hotel, but from a short distance one would never guess their existence, for the landscape appears to consist of a continuous expanse of rolling prairie On the shale slopes a number of species are found which are rare or absent elsewhere. Of greater interest, however, are the small ponds and marshy spots scattered all over the prarie. In 1919 all these places were quite dry, but in a year of moderate rainfall they must be full of water or at least wet throughout the season. Umbach collected here a number of water plants not found by the writer; in 1919 there was no water in which they might grow. But in such an abnormally dry season these spots supported a large number of plants found nowhere else, like *Typha, Sagittaria, Alisma, Rumex maritimus, Polygonum muhlenbergii, Potentilla anserina, Taraxia, Boisduvallia, Hippuris, Gentiana affinis, Navarretia, Allocarya,* and *Orthocarpus.* In many of these depressions the soil is strongly alkaline, and there are found a a few halophilous plants, such as *Distichlis spicata, Dondia depressa, Atriplex hastata, Chenopodium humile,* and *Halerpestes cymbalaria.*

CANADIAN ZONE.

The Canadian Zone covers by far the largest portion of the park, for it includes all the timbered portion except a narrow belt just below timber line (see pls. 37, 38, B). It extends from practically the base of the mountains (1,440 meters on the east slope and 950 meters on the west slope) up to an elevation of 1,800 to 2,100 meters, accord-

ing to exposure. Within this area, too, are found a larger number of species than in any of the other zones. The trees of the east slope are the alpine fir, Douglas fir, spruces, limber pine, lodgepole pine, cottonwood, and aspen; but of these, the limber pine and cottonwood do not occur in sufficient abundance to be an important element of the forest. On the west slope are found the same trees, but in addition the great silver fir, hemlock, western white pine, larch, giant cedar, and canoe birch. The chief shrubs of the Canadian Zone are the following: Ground juniper, yew (west slope only), numerous species of willows, alders, purple clematis, Oregon grape, gooseberry, currants, ninebark (west slope), white meadowsweet, red raspberry, black raspberry (west slope), thimbleberry, mountain-spray, several species of wild rose, chokecherry, pin cherry, mountain-ash, black hawthorn (often a tree on the west slope), serviceberry, buckthorn, maple (often a small tree), mountain lover, deerbrush, Canada buffaloberry, devil's-club (west slope), red-osier dogwood, Labrador tea (west slope), menziesia, whortleberries, elderberry, twinberries, snowberry, and highbush cranberry (west slope). The following is a list of some of the more characteristic herbaceous plants of the zone. Those marked with an asterisk extend also into other zones in more or less abundance.

*Xerophyllum tenax.**
Veratrum viride.
Clintonia uniflora.
Disporum spp.
*Streptopus amplexifolius.**
Claytonia parvifolia.
*Arenaria formosa.**
Actaea rubra.
*Thalictrum megacarpum.**
Nymphaea polysepala.
Cardamine breweri.
*Tiarella unifoliata.**
Fragaria spp.
*Lupinus sericeus.**
*Lupinus tenellus.**
Geranium viscossisimum.
Sphaeralcea rivularis.
Viola canadensis.
Viola orbiculata.
Epilobium angustifolium.
Epilobium adenocaulon.
Aralia nudicaulis.
*Heracleum lanatum.**
Sanicula marilandica.
Angelica lyallii.
Cornus stolonifera.
*Pyrola asarifolia.**
Chimaphila umbellata occidentalis.
Galium triflorum.
Galium trifidum.
Linnaea borealis.
Hieracium albiflorum.
Prenanthes sagittata.
Aster conspicuus.
Aster sayianus.
*Aster engelmannii.**
Balsamorrhiza sagittata.
Anaphalis margaritacea.
Adenocaulon bicolor.
Arnica latifolia.
*Senecio triangularis.**

The timbered portions of the Canadian Zone are easily recognized by the characteristic tree species, with the accompanying herbaceous plants; but the open slopes are not so easily classified, since there is often a puzzling admixture of Transition and Hudsonian species. As remarked above, Canadian plants extend far down along the streams. In this connection one fact should be noted: Running

water plays a more or less important part in plant dissemination in mountain regions, for the streams often bring down seeds from alpine slopes even to the plains, and the plants thus propagated frequently thrive at low altitudes. *Epilobium latifolium* is certainly a typical plant of alpine meadows and rock slides, but it is found in many places along streams at low altitudes, often in considerable abundance and in greater luxuriance than at high altitudes. Along the creek at St. Mary *Dryas drummondii* is more abundant and more vigorous than above timber line, yet it is evident to any botanist that the plant is there only by accident. Along the creek at the east entrance stray plants of many alpine species may be found.

There is a conspicuous difference between the forests of the east and west slopes of the park. As indicated above, there are several important timber trees which grow only on the west slope, although there are none peculiar to the east slope. Moreover, on the west slope the timber is much denser and the trees are larger (see pl. 38, B). The general appearance of the forest is very different on the two slopes, the differences becoming conspicuous just as soon as one crosses the continental divide. The greater development on the west slope is due presumably to the greater amount of rainfall in that region, and probably also to the lower elevation.

It is rather remarkable that while the differences between the forests of the two slopes are so strongly marked, there are no proportionate differences in the case of the herbaceous and shrubby vegetation. The predominating species of the herbs and shrubs are largely the same, and the differences in the general appearance of the vegetation are mostly such as are to be expected as a consequence of the differences in forest density. On the west slope the forest is in many places so dense that there is scarcely any herbaceous vegetation, but on the east slope there is always a luxuriant growth of herbaceous plants.

The following shrubs and herbaceous plants are chiefly or entirely confined to the west slope: *Taxus brevifolia*, *Scheuchzeria palustris*, *Lysichiton kamchatcensis*, *Trillium ovatum*, *Nymphaea polysepala*, *Drosera rotundifolia* and *D. longifolia*, *Opulaster malvaceus*, *Potentilla palustris*, *Rubus leucodermis*, *Rosa gymnocarpa*, *Aralia nudicaulis*, *Echinopanax horridum*, *Cicuta bulbifera*, *Ledum glandulosum*, *Vaccinium canadense*, *Melampyrum lineare*, and *Viburnum pauciflorum*. Most of these are species which are typical of the Pacific slope, but their total does not form an important percentage of the whole herbaceous vegetation. In the case of the trees of the Canadian Zone over 40 per cent of the species are found only on the west slope, and it might be expected that an equal proportion of the herbaceous species would be similarly restricted. On the east slope of the park the writer collected many species of herbaceous plants

(but no important ones) which he did not find on the west slope, but it is probable that this is due to the less amount of time spent in the latter region, and to the lateness of the season at which the collections were made. On the plains east of the park (Transition Zone) there are many species of plants not found on the west slope, because there is no similar area in the latter region.

On both slopes of the park it is apparent that the vegetation of the Canadian Zone is not homogeneous, and that there is a marked difference between the lower and upper portions. On the west slope the great silver fir, hemlock, western white pine, larch, giant cedar, aspen, cottonwood, and canoe birch are found only at lower levels. These, it may be noted, include all the Pacific coast species. The larch extends higher up, perhaps, than any of the others. It is at the low altitudes that the forest is most dense; higher up the timber is thinner, and spruces and alpine fir are more abundant. Around Lake McDonald the lodgepole pine, which is so abundant on the east slope, is not very common, and its place is taken largely by the larch.

On the east slope the lower part of the Canadian Zone is timbered chiefly with lodgepole pine, which often forms extensive, dense, nearly pure stands, and with aspens. There is some admixture of cottonwood, Douglas fir, and limber pine, and frequently of other trees. In some places there are areas covered almost exclusively with Douglas fir, and the aspen forms extensive groves, especially along the automobile road. On the higher slopes the trees are chiefly alpine fir, spruces, and Douglas fir. There is a pronounced difference also in the herbaceous vegetation of the two belts of this zone.

There are numerous special localities in the Canadian Zone which are of particular interest botanically. Along the streams are many swampy thickets, where water-loving plants abound. Most of the larger lakes lie in this zone, but their flora is rather meager. In most of them the water seems to be too cold for the growth of water plants, but in St. Mary and McDonald lakes several pondweeds grow in some quantity. On the west slope there are small lakes only a few acres in extent where pondweeds, yellow pondlily, bur-reeds, bladderwort, and other water plants are plentiful. In slow stretches of the streams pondweeds, *Callitriche*, bur-reeds, water buttercups, and other plants are often found.

One of the most interesting localities in the Many Glacier region is a bit of deep swampy woods along Swiftcurrent Creek, shortly below the falls (see pl. 36). This area is difficult to explore because of fallen logs, beaver dams, and bogs, but it yields many plants that locally are rare, such as *Cornus canadensis*, *Habenaria obtusata*, *Pyrola minor*, and *Mitella nuda*. Farther down the stream, close to the automobile road, is a boggy meadow, in whose center rises a

large spring of cold water, from which a good-sized stream flows to the creek. The coldness of the water must have a decided influence upon the vegetation, for here, surrounded chiefly by Transition vegetation, are found such plants as *Eriophorum chamissonis*, *Carex gynocrates*, *Salix candida*, *Pinguicula vulgaris*, *Petasites sagittata*, and several others which are commonly found only at much higher altitudes. Just above the edge of the road along the side of Altyn Peak, on an open slope, is a small bog carpeted by deep moss and filled with scrub birch. In it there are hundreds of plants of *Botrychium virginianum*, growing with other species that are scarce in this region. Dozens of similar spots of exceptional interest might be mentioned.

One of the most distinctive botanical features of the park is the large sphagnum bogs about Fish and Johns lakes (see pl. 40, B), on the west slope, and a visit to these localities, which are within a short distance of the head of Lake McDonald, will richly repay anyone searching for the less common plants. These bogs are similar to many that are found in the eastern and northern States. They have a dense covering of different species of *Sphagnum*, through which one's feet sink into water. Some of the sphagnum masses extend out into the lake, and many of them are merely floating upon the water, so that they will not support any considerable weight. The sphagnum belt is only a few yards wide, and is bordered by a thicket of shrubs, which gradually encroaches upon the bog. In and at the edge of the sphagnum grow such plants as *Lycopodium selago*, *L. annotinum*, *L. clavatum*, and *L. complanatum*, *Dryopteris cristata*, *Scheuchzeria palustris*, *Eriophorum chamissonis*, *Carex diandra*, *C. limosa*, *C. buxbaumii*, and *C. lasiocarpa*, *Juncus filiformis*, *Ibidium romanzoffianum*, *Drosera rotundifolia* and *D. longifolia*, *Potentilla palustris*, *Cicuta bulbifera*, and *Kalmia microphylla*. Most of these are species which are not found elsewhere in Glacier Park.

HUDSONIAN ZONE.

The Hudsonian Zone is the least clearly defined of all the zones represented in the park. It is stated by competent authorities that in some regions this zone is well marked, but the writer has never seen such a locality. In Glacier Park, as in many other places, it is an ill-defined belt which forms a sort of transition between the Canadian and Arctic-Alpine zones, and its vegetation consists of a mixture of species which are characteristic of those areas. It embraces a rather narrow belt at the upper edge of the timbered slopes, covered with small, often stunted trees and shrubs, which are often widely spaced, with open meadows between them (see pls. 41, 42). The Hudsonian

Zone seems to include also some of the meadows above the timber, but it is impossible to draw any sharp line here. Sometimes the heavy timber of the Canadian Zone borders directly upon alpine meadows, without any intervening transitional zone.

The characteristic trees of the Hudsonian Zone are the alpine fir and whitebark pine, but the fir, of course, grows also at lower altitudes. Douglas fir and limber pine sometimes grow about timber line, and the alpine larch grows here if anywhere in the park. At the upper limit of timber the wind blows violently much of the time, and for most of the year the ground is covered with snow, so that trees find existence difficult; consequently, most of them are stunted or twisted, and many are mere shrubs. Frequently they are bent down by the wind and snow, their trunks lying flat upon the ground. In such cases their branching is abnormally dense, and these stunted trees often form impenetrable thickets.

The principal shrubs of the zone are willows (*Salix vestita*), green alder, spiny currant, pink meadowsweet, red raspberry, mountain-ash, menziesia, Rocky Mountain laurel, red and white heather, whortleberries (*Vaccinium membranaceum* and *V. scoparium*), and elderberry. The laurel and heathers are practically confined to this zone, but the other shrubs are more widely distributed.

The herbaceous vegetation is rather varied, and because of abundant moisture it is remarkably luxuriant. Here are found more lavish displays of color than at any other level, and the meadows are often an indescribable riot of color. The flower displays endure longer here than elsewhere, for snow banks lie until the end of the summer, and as they melt new beds of flowers are coming continuously into bloom. The following list indicates the characteristic herbaceous plants of the Hudsonian Zone:

Phleum alpinum.
Xerophyllum tenax.
Tofieldia intermedia.
Streptopus amplexifolius.
Polygonum bistortoides.
Silene multicaulis.
Trollius albiflorus.
Aquilegia flavescens.
Thalictrum megacarpum.
*Delphinium depauperatum.**
*Pulsatilla occidentalis.**
Tiarella unifoliata.
Sibbaldia procumbens.
Hypericum scouleri.
Antennaria racemosa.
Arnica spp.
Senecio triangularis.
Viola glabella.
*Angelica dawsoni.**
*Gaultheria humifusa.**
Dodecatheon pauciflorum.
*Gentiana calycosa.**
Romanzoffia sitchensis.
Lappula diffusa.
Mimulus lewisii.
Castilleja spp.
Pedicularis groenlandica.
Pedicularis bracteosa.
Valeriana sitchensis.
Aster engelmannii.
*Erigeron salsuginosus.**
*Senecio megacephalus.**
Senecio ovinus.

The species marked with an asterisk are nearly or altogether confined to this belt, while the others are abundant elsewhere as well. It is evident that very few species are peculiar to the Hudsonian Zone.

The flora of the zone is much the same wherever it is found, and there are no localities in it of exceptional interest. The plants can be studied easily at Granite Park, Iceberg Lake, Sexton Glacier, Gunsight Lake, Sperry Chalets, and many other localities.

ARCTIC-ALPINE ZONE.

The Arctic-Alpine Zone includes all vegetation above the Hudsonian, and covers all the slopes above 1,800 to 2,100 meters (see pls. 43, 44). In mountain regions in general the plants of this zone are found only about the higher summits, but in Arctic regions the same species grow at sea level. The species are more widely distributed than those of any other division and many of the characteristic plants of the higher levels of Glacier Park are found also in Europe and Asia. Vegetation extends to the summits of some of the peaks of Glacier Park, but on others it ceases far below the summits. In places plants grow close to the sides of the glaciers and snow banks, but often there are wide stretches of rocks and gravel upon which no vegetation exists.

It is impossible, as stated above, to draw a sharp line between the Hudsonian and Arctic-Alpine zones. The latter region is composed of wet meadows, of rocky slopes of loose stones with a large amount of soil between them, of areas of exposed rock in place, and of great slides of loose rock in which there is little or no soil. In the meadows especially it is difficult to determine which zone is represented, for here truly Arctic species are associated with those of lower altitudes. On rock slides and on exposed summits the flora is decidedly different, and there is no doubt that it is purely Arctic. Just as soon as one leaves the meadows and begins to climb a rock slide, an abrupt change in the flora is apparent, yet it is hardly possible to restrict the Arctic-Alpine Zone to these slides and to the exposed summits.

There are no trees in the zone, of course, but there are dwarfed shrubs, especially low willows, which frequently form dense bushy masses of considerable extent. At Cracker and Iceberg lakes willows are particularly abundant. Most of them are shrubs 30 to 60 cm. in height, but there are also smaller species, some of which creep closely along the ground. Scrub birch sometimes grows on high slopes, also bush cinquefoil; and the heathers grow here as well as in the Hudsonian Zone. Two species of *Dryas* are common, but in spite of their woody stems they resemble herbs much more than shrubs.

The herbaceous plants are rather numerous, as shown in the following list. The species marked with an asterisk grow only on rock slides and in the most exposed places.

Phleum alpinum.
Tofieldia palustris.
Eriogonum depressum.
*Eriogonum androsaceum.**
Rumex acetosa.
Oxyria digyna.
Polygonum viviparum.
*Claytonia megarrhiza.**
Claytonia lanceolata.
Silene acaulis.
*Lychnis apetala.**
*Cerastium alpinum.**
*Stellaria americana.**
Stellaria laeta.
Sagina saginoides.
*Arenaria nuttallii.**
Arenaria formosa.
*Arenaria rossii.**
Trollius albiflorus.
*Aquilegia jonesii.**
Anemone parviflora.
*Papaver pygmaeum.**
Draba glacialis.
*Draba andina.**
*Draba oligosperma.**
Draba crassifolia.
Smelowskia americana.
Arabis lyallii.
*Parnassia kotzebuei.**
Sedum integrifolium.
Saxifraga rhomboidea.
*Saxifraga oppositifolia.**
Saxifraga adscendens.
Saxifraga rivularis.
Saxifraga lyallii.
Leptarrhena pyrolifolia.
*Potentilla nivea.**
Potentilla glaucophylla.
Lupinus minimus.
Astragalus bourgovii.
Oxytropis alpicola.
*Oxytropis parryi.**
Epilobium alpinum.
Epilobium anagallidifolium.
*Polemonium viscosum.**
Phacelia lyallii.
Myosotis alpestris.
Pentstemon ellipticus.
Veronica wormskjoldii.
Castilleja occidentalis.
Pedicularis contorta.
*Crepis nana.**
Solidago ciliosa.
*Erigeron lanatus.**
Erigeron unalaschkensis.
Erigeron jucundus.
Arnica alpina.
*Arnica tomentosa.**
*Senecio conterminus.**
Senecio fremontii.

Not all the species listed are confined to this zone, but most of them are so limited. Few of them are found below the Hudsonian Zone, except under abnormal conditions.

Most of the plants of the Arctic-Alpine Zone may be found in any locality above timber line. The majority are widely dispersed in this belt, but some are of local occurrence. On rock slides (see pl. 44, B) the individuals are not numerous, and they are often half hidden under the rocks; consequently one occasionally stumbles upon a single individual of a given species, but searches in vain for a second one. It is hard to see how plants can grow on the rock slides, where there is no soil visible and where the rocks are rolling downward almost constantly. Most of the plants found in such places have remarkably long roots, and in many instances the roots are very elastic, so that a plant is not easily torn up or broken off if a rock rolls over it.

The Arctic-Alpine Zone may be studied easily at Iceberg Lake, Cracker Lake, Ptarmigan Lake, Sexton Glacier, Gunsight Pass, Swiftcurrent Pass, Sperry Glacier, and at various other easily accessible localities. Frequently, also, patches of Arctic-Alpine vegetation are found at middle or even rather low altitudes, especially where the snow lies late in the summer. On the rock slides above Many Glacier Hotel, which may be reached in half an hour by an easy climb, one may find most of the plants that grow on the rock slides above Cracker Lake; and on the slopes of Altyn Peak, above Many Glacier Chalets, many alpine species are represented.

SCOPE AND PLAN OF THE FLORA.

The present list is intended to include all the species of flowering plants, ferns, and fern allies which have been found in the park. The number listed is 955. With more thorough exploration the list undoubtedly will be greatly increased, for no part of the region has been thoroughly explored botanically, and the greater portion of the park has not even been visited by a botanist. The number of species still to be discovered can not be expected to be proportional to the area which remains unexplored, for most of the common plants of the park are included in this catalogue. Although the flora is only imperfectly known, it seems worth while to place on record our present knowledge of it, for the region affords botanical features of exceptional interest. The published flora will be found useful not only in Glacier Park, but in many parts of western Montana and in adjacent Alberta and British Columbia.

The list of species here presented is the result chiefly of field work conducted by the author during July, August, and September, 1919, under cooperation of the National Park Service of the Department of the Interior and the United States National Museum. The exploration was conducted primarily in order to obtain data for a popular account of the plants of the park, which is to be published soon by the National Park Service for the use of visitors to the region. It was therefore necessary to give chief attention to those portions of the park most visited by tourists, and it was found that the investigation of these areas required the whole time available for field work. The writer visited all the localities generally seen by tourists, and covered most of the trails on foot. The larger part of the summer was spent on the east slope, with headquarters at Many Glacier Hotel, the most centrally located of all the hotels and camps. The Many Glacier region was explored rather thoroughly, and its flora and that of the region about the east entrance are now better known botanically than any other portions of the park. Although the writer was able to spend only three weeks on the west slope, and those in late summer, it was possible nevertheless to cover all the

trails, since they are not nearly so extensive as those of the east side of the park.

Besides the work done inside the park proper, extensive collections were made also at the "east entrance" (Glacier Park station on the Great Northern Railroad, formerly known as Midvale), and at Belton, the west entrance. The plants collected at these localities are listed here, for it is probable that nearly all are found also within the actual park boundaries. Certainly those found at Belton must be, that station being separated from the park only by one of the forks of the Flathead River. The east entrance is farther removed from the park; yet nearly all of even the typical prairie species of that region must be expected to cross the boundaries on the foothills or along the low stream valleys. At any rate, it is desirable that the floras of these two localities should be included, for many visitors spend considerable time at one or both stations, which are for practical purposes a part of the park.

The summer of 1919 was not a favorable season for botanical work in northwestern Montana, since it was the third of a series of dry years; practically no rain fell during the summer, and the snowfall of the preceding winter was exceptionally light. As early as the first of July the vegetation upon the prairies was almost as dry as tinder, and on the foothills conditions were not much better. Even in the heavy forest the ground became very dry by midsummer, and the plants drooped and withered. At high altitudes, where the snowfall is heavier and evaporation less rapid, plants were probably nearly as luxuriant as in normal seasons. While the dry season increased the comfort of travelers in the park, it was most unfavorable for the growth of plants. Probably most of the species of the region were represented during the season by growing plants, but some of them withered so early that the writer did not see them. On account of the dryness of the summer it may be that the habitats of some of the species have been indicated as more arid than they would be in a normal season. In the Rockies the amount of moisture in a given locality varies so much from month to month or even from week to week that it may be described at one time as "dry" and with equal correctness at another season as "wet." The writer has often had occasion to note this in labeling or working over a summer's collection, for sometimes a plant collected in midsummer during the rainy season was, according to the notes, collected on a "wet grassy slope," while a less mature plant from exactly the same hillside, but collected early in the summer, might be noted as coming from a "dry "slope.

Keys for the identification of the genera and species accompany the present catalogue of species, and there is also an artificial key to the families, based so far as possible upon leaf characters and

upon those flower characters that can be seen easily. The descriptive notes under each species are brief, and are intended only to supplement the characters indicated by the keys. It has been the purpose throughout to use only such technical terms as could not be avoided except by the sacrifice of accuracy. A few synonyms have been inserted in parentheses. They are cited chiefly in the case of plants for which two generic names are in use by botanists who follow different systems of nomenclature. The names of Rydberg's Flora of the Rocky Mountains have been listed when they differ from those employed here.

EARLIER BOTANICAL EXPLORATION.

All the species here enumerated were collected by the writer in 1919, unless otherwise indicated. The only exception is in the case of the grasses; no attempt was made to collect these, and only a few specimens were obtained. Aside from the writer's collections there are in the United States National Herbarium probably less than a thousand specimens from Glacier Park. Several previous collections have been made in the region, but only a few of them are represented here.

The most important earlier collection in the National Herbarium is that obtained by L. M. Umbach, of Northwestern College, Naperville, Illinois, in 1901. Umbach's collections were obtained chiefly at the east entrance (Midvale), Mount Henry, Belton, and Sperry Glacier. His specimens from the east entrance have been particularly valuable in the preparation of this list, for the season of 1901 was undoubtedly a favorable one, and he obtained a considerable number of species not found there by the writer.

In 1897 Mr. R. S. Williams, now of the New York Botanical Garden, was a member of the party which surveyed the west boundary of the Blackfoot Indian Reservation, and was in the region from late June until late September. Mr. Williams was interested chiefly in mosses, but he collected flowering plants also. In earlier years he made large collections of plants about Columbia Falls, and some on the west slope of Glacier Park. Columbia Falls is only about 12 miles west of Belton, but many of the plants collected there have not yet been found in Glacier Park. The writer has not deemed it advisable to list them, but it is probable that most of them will be found on the west slope, at least along the North Fork of the Flathead.

In July, 1898, Prof. J. M. Holzinger, of Winona, Minnesota, collected about the head of Lake McDonald. He also was interested chiefly in mosses, but he made a small collection of flowering plants, which is in the National Herbarium.

In 1900 Dr. David Griffiths, of the United States Department of Agriculture, in company with Mr. E. F. Lange, visited western Montana for the purpose of studying the grasses. He spent about a week at Summit, a station on the Great Northern Railroad, on the south boundary of the park. He collected grasses here and at other stations in the vicinity.

In 1901 Dr. Stuart Weller, of the University of Chicago, was paleontologist of a party sent out by the United States Geological Survey to determine the condition of the international boundary monuments, and to secure information regarding the geology of the region traversed. Doctor Weller obtained a small collection of plants, some of which are not otherwise known from the region. All those seen by the writer are from the northern portion of the east slope.

In the same year Mr. F. K. Vreeland, an electrical engineer of New York City, made a rather extensive collection on the west slope, in the region of McDonald and Camas lakes. The plants were determined at the New York Botanical Garden by Dr. P. A. Rydberg, and a partial set of them is in the National Herbarium. Several species were described as new by Doctor Rydberg from this collection.

In 1914 Prof. A. S. Hitchcock, of the Department of Agriculture, spent three weeks in Glacier Park, collecting grasses. The list of grasses presented here is based chiefly upon his collections. In addition he obtained a considerable series of other plants.

Mr. Vernon Bailey, of the Bureau of Biological Survey, Department of Agriculture, made a small collection of plants in the park in 1917, while engaged in the preparation of his report upon the mammals.

Mrs. Otto Thompson, of Glacier Park station, has presented to the National Museum two small collections of the early spring plants, from the vicinity of the east entrance. These contain some species not otherwise known from the region.

The collections enumerated above are the only ones in the National Herbarium from Glacier Park, but several others have been made in the region. Mr. Marcus E. Jones, of Salt Lake City, Utah, collected in the park, chiefly at Sperry Glacier, and he has published a list of the species obtained (see bibliography). Mr. John G. Jack, of the Arnold Arboretum, made a collection of trees and shrubs at St. Mary Lake in September, 1918. Others who have collected in the park are Miss Gertrude P. Norton; Prof. M. J. Elrod, of the University of Montana; Mr. M. P. Somes, of Kalispell, Montana; and Mr. Titus Ulke.

There should not be omitted, also, the tourists, some of them amateur botanists of no mean ability, who every year preserve dried specimens of the plants whose acquaintance they make here for the first time. There must be dozens, if not hundreds, of such herba-

ria scattered about the United States, some of which in the course of time will doubtless pass into the possession of the larger botanical institutions.

ACKNOWLEDGMENTS.

The field investigation of which this publication is a result was performed under the direction of the National Park Service, and the officials of that office have facilitated the work in every possible manner. To Mr. W. W. Payne, superintendent of Glacier Park, and to several of the park rangers, the writer is particularly indebted for assistance while in the field. Acknowledgments are due also to Mr. H. A. Noble, of the Glacier Park Hotel Co.; to Mr. Roe Emery, of the Glacier Park Transportation Co.; and to Mr. J. E. Lewis, of the Glacier Hotel, all of whom aided materially in the successful prosecution of the field work. Many of the employees of the hotel and transportation companies also rendered important assistance in many ways.

The late Miss Gertrude Norton, of Salt Lake City, contributed a large amount of information regarding the plants of Montana, much of which is published here. Through her long field work in Montana Miss Norton had gained an intimate knowledge of the plants, especially the orchids, and she shared this knowledge generously with visitors to the park.

The writer is deeply indebted to those who have assisted directly in preparing the accompanying account of the Glacier Park flora. Mrs. Agnes Chase, of the United States Department of Agriculture, has prepared the account of the grasses; Mr. C. R. Ball, of the Department of Agriculture, that of the willows; and Mr. Kenneth K. Mackenzie, of New York City, the treatment of the genus *Carex*. Prof. J. H. Schaffner, of Ohio State University, has furnished the key to the species of *Equisetum*.

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——— *Grimmia manniae* and *Grimmia holzingeri*. Bryologist **4**: 10–12. 1901.
A new species described from Sperry Glacier.

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H. bestii, from Lake McDonald.

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A species of Glacier Park.

——— A puzzling moss from northwestern Montana. Bryologist **5**: 26–27. 1902.
Amblystigium montanae Bryhn, a new species from Lake McDonald.

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Contains an extensive list of flowering plants of northwestern Montana, about 195 of which are reported definitely from Glacier Park. A list of 190 species of mosses from the park is included, most of them collected by Holzinger. Of hepatics, 25 species are enumerated, and of lichens 3 species.

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Sixty-one species listed.

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Numerous species are listed from Glacier Park.

SYSTEMATIC TREATMENT.

KEY TO THE FAMILIES.

I. Pteridophyta. Ferns and Fern Allies.

Plants without true flowers, reproducing by spores (no embryo being formed); fern-like, mosslike, or rushlike plants.

Stems hollow, jointed, grooved; leaves reduced to toothed sheaths surrounding the joints . . . . . **EQUISETACEAE** (p. 268).
Stems neither hollow, jointed, nor grooved; leaves never reduced to sheaths.
Leaves small (1 cm. long or less), very numerous, sessile, awl-shaped or bractlike, 4 to many-ranked; plants more or less mosslike.
Plants depressed or short-creeping, 3 to 5 cm. high or less; stems slender, not over 3 mm. thick (including the leaves); spores of 2 kinds, megaspores and microspores . . . . . **SELAGINELLACEAE** (p. 271).
Plants tall or wide-creeping, often more than 10 cm. high; stems (including the leaves) often much more than 3 mm. in diameter; spores all alike.
LYCOPODIACEAE (p. 270).
Leaves much larger, few, neither awl-shaped nor scalelike, stalked, clustered or solitary; plants not mosslike.
Sporangia (spore cases) large, borne in a stalked terminal spike or loose panicle, the sterile blade entire or several times divided.
OPHIOGLOSSACEAE (p. 263).
Sporangia very small, borne in clusters (sori) on the back of ordinary foliage leaves
POLYPODIACEAE (p. 264).

II. Spermatophyta. Flowering Plants.

Plants with true flowers, reproducing by seeds, these containing an embryo.

I. Trees and Shrubs.

Leaves needle-like, linear, or scalelike, evergreen (except in *Larix*); fruit a cone or a berry.
Fruit a cone or a nearly dry bluish berry . . . . . **PINACEAE** (p. 273).
Fruit a juicy red berry . . . . . **TAXACEAE** (p. 272).
Leaves neither needle-like nor scalelike (except in one small parasitic plant), rarely linear, but the fruit then a capsule.
Leaves opposite.
Plants parasitic upon evergreen trees, very small (5 to 10 cm. high).
LORANTHACEAE (p. 438).

Plants not parasitic.
Plants climbing; leaves of three or more leaflets . . . . . **Clematis** (p. 339).
Plants erect, never climbing; leaves simple or compound.
Leaves toothed or lobed, or composed of several leaflets.
Leaves evergreen, thick and leathery, with small low teeth; flowers very small, green, sessile in the axils of the leaves.
CELASTRACEAE (p. 375).
Leaves deciduous, thin, with coarse teeth, or often lobed or compound; flowers various.
Petals distinct; fruit dry, winged . . . . . **ACERACEAE** (p. 375).
Petals united; fruit fleshy, not winged . . . **CAPRIFOLIACEAE** (p. 412).
Leaves entire.
Leaves covered beneath with silvery and brownish scales; corolla none, the flowers greenish yellow; fruit red, juicy . . . . . **Lepargyrea** (p. 378).
Leaves somewhat hairy or glabrous, never scaly; corolla present, never yellow; fruit never red.
Fruit a capsule; leaves evergreen, leathery, glaucous beneath; corolla 10 to 15 mm. wide, bluish purple . . . . . **Kalmia** (p. 390).
Fruit juicy; leaves deciduous, thin, green; corolla 5 mm. wide or less, white or pink.
Leaves acute; flowers white, in terminal flat-topped clusters.
Cornus (p. 387).
Leaves very obtuse; flowers pink, clustered in the leaf axils.
Symphoricarpos (p. 413)
Leaves alternate.
Stems armed with spines or prickles.
Leaves compound, composed of 3 or more leaflets . . . . **ROSACEAE** (p. 358).
Leaves simple, toothed or lobed.
Leaves very large (20 to 60 cm. wide), covered with prickles on the under side.
Echinopanax (p. 383).
Leaves small, not prickly.
Leaves as broad as long or broader; stems with short slender prickles; flowers in racemes, never white . . . **GROSSULARIACEAE** (p. 357).
Leaves longer than broad; stems with long stout spines; flowers in flat-topped clusters, white . . . . . **Crataegus** (p. 366).
Stems never with spines or prickles.
Leaves compound, composed of 5 or more leaflets.
Leaflets with spiny teeth, evergreen; flowers in racemes; fruit blue.
BERBERIDACEAE (p. 344).
Leaflets never with spiny teeth, deciduous; flowers not in racemes; fruit not blue.
Flowers white; fruit juicy; leaflets 3 to 6 cm. long . . . **Sorbus** (p. 366).
Flowers yellow; fruit dry; leaflets 2 cm. long or less . . **Potentilla** (p. 359).
Leaves simple, entire or toothed.
Leaves covered with silvery scales on both surfaces . . . **Elaeagnus** (p. 378).
Leaves never with silvery scales on both surfaces.
Leaves entire.
Flowers in catkins; leaves usually with stipules . . . . . **Salix** (p. 319).
Flowers not in catkins; leaves without stipules.
Flowers in dense heads surrounded by small bracts; leaves white-hairy . . . . . **Artemisia** (p. 432).
Flowers never in heads; leaves not white-hairy . **ERICACEAE** (p. 390).

Leaves from finely toothed to lobed.
Flowers green, without a corolla, in catkins; fruit sometimes conelike.
Fruit conelike; seeds not hairy . . . . . **BETULACEAE** (p. 324).
Fruit a small capsule; seeds each with a tuft of hairs.
SALICACEAE (p. 317).
Flowers not green, with a corolla, never in catkins; fruit not conelike.
Leaves conspicuously lobed, about as broad as long.
Petals 1.5 to 3 cm. long; fruit like a raspberry . . . **Rubus** (p. 364).
Petals less than 5 mm. long; fruit like a currant . . **Ribes** (p. 357).
Leaves toothed but never lobed.
Corolla of united petals; fruit juicy, with minute seeds.
VACCINIACEAE (p. 392).
Corolla of distinct petals; fruit dry, or sometimes juicy, but with large or rather large seeds.
Fruit juicy, containing a single seed . **AMYGDALACEAE** (p. 367).
Fruit dry or, if juicy, containing 2 or more seeds.
Flowers in racemes; fruit juicy . . . . . **Amelanchier** (p. 366).
Flowers not in racemes; fruit dry or juicy.
Stamens 4 or 5; fruit dry or juicy; flowers green or white.
RHAMNACEAE (p. 375).
Stamens 15 or more; fruit dry; flowers white or pink.
ROSACEAE (p. 358).

II. Herbaceous Plants.

Plants grasses or resembling grasses; corolla green or brownish or none.
Flowers not inclosed by husklike scales, composed of 3 sepals and 3 petals; fruit a capsule, containing 3 or more seeds . . . . . **JUNCACEAE** (p. 305).
Flowers inclosed by husklike scales, without a proper calyx or corolla; fruit 1-seeded, not opening.
Leaves in 2 ranks on the stems; stems round or somewhat flattened, usually hollow; leaf sheaths usually split; flowers with 2 bracts, one above and one below . . . . . **POACEAE** (p. 280).
Leaves in 3 ranks; stems round or usually 3-angled; leaf sheaths not split; flowers with only one bract, this below . . . . . **CYPERACEAE** (p. 294).
Plants not grasslike; leaves sometimes resembling grass leaves but the plants then with colored flowers.
A. Leaves composed of 3 or more leaflets, or else lobed to the midrib.
Plants floating on or submerged in water.
Leaves alternate; flowers white . . . . . **Batrachium** (p. 341).
Leaves opposite or whorled; flowers green or yellow.
Leaves with small bladders; corolla yellow, spurred, of united petals.
Utricularia (p. 410).
Leaves without bladders; corolla of minute distinct greenish petals or none.
Myriophyllum (p. 382).
Plants not growing in water.
Flowers sessile in dense heads, the head surrounded by bracts and often resembling a single flower . . . . . **ASTERACEAE** (p. 419).
Flowers not in a dense head surrounded by bracts.
Leaves opposite, or else all borne at the base of the naked stem.
Flower-bearing stems naked, the leaves all at the base of the stem.
Leaflets 3, entire; corolla of united petals.
MENYANTHACEAE (p. 395).
Leaflets more than 3, toothed or lobed; corolla of distinct petals.
Flowers solitary on the stems; fruit a capsule; leaves many.
PAPAVERACEAE (p. 344).

Flowers in umbels; fruit a berry; leaves 1 or 2 . . . . **Aralia** (p. 383).
Flower-bearing stems leafy.
Plants hairy; corolla of distinct petals . . **GERANIACEAE** (p. 374).
Plants glabrous or nearly so; corolla of united petals.
VALERIANACEAE (p. 413).

Leaves alternate, the stems leafy.
Corolla of united petals.
Capsule 3-celled; flowers not in 1-sided racemes.
POLEMONIACEAE (p. 396).
Capsule 1-celled; flowers mostly in 1-sided racemes, these often clustered . . . . . **HYDROPHYLLACEAE** (p. 397).
Corolla of distinct petals, or sometimes wanting.
Flower shaped like that of a bean or pea; fruit a legume.
FABACEAE (p. 367).
Flower not like that of a bean or pea; fruit not a legume.
Flowers in umbels; fruit of 2 united carpels, these separating at maturity . . . . . **APIACEAE** (p. 383).
Flowers not in umbels; fruit not of 2 carpels.
Petals 4; flowers in racemes; fruit a pod, this splitting into 2 parts.
Petals unlike, one of them spurred; leaves divided into numerous narrow lobes . . . . . **FUMARIACEAE** (p. 344).
Petals all alike, not spurred; leaves of few, mostly broad leaflets.
Leaflets 3, attached at the end of the petiole, entire; petals about 1 cm. long, purplish . . **CAPPARIDACEAE** (p. 352).
Leaflets more than 3, some attached along the sides of the petiole, usually toothed; petals smaller.
BRASSICACEAE (p. 344).
Petals 5 or more or wanting; flowers not in racemes; fruit various.
Stamens 5 or 10; flowers white or pink.
SAXIFRAGACEAE (p. 353).
Stamens 15 or more; flowers of various colors.
Leaves without stipules; sepals distinct; petals often absent.
RANUNCULACEAE (p. 338).
Leaves with stipules; sepals more or less united; petals present.
ROSACEAE (p. 358).

AA. Leaves simple, entire or toothed, sometimes lobed but not lobed to the midrib.
Plants floating on or submerged in water.
Plants very small, 1 cm. long or less, without leaves, floating and not attached.
LEMNACEAE (p. 304).
Plants many times larger, with leaves, attached to the bottoms of streams or lakes.
Leaves in whorls of 6 to 12 . . . . . **Hippuris** (p. 383).
Leaves opposite or alternate, not whorled.
Leaves cordate at the base, 15 to 20 cm. wide or larger; flowers yellow, 6 to 10 cm. broad . . . . . **NYMPHAEACEAE** (p. 338).
Leaves not cordate, much smaller; flowers small and green.
Flowers in globose heads . . . . . **SPARGANIACEAE** (p. 277).
Flowers not in heads.
Leaves 5 to 20 mm. long; flowers sessile in the leaf axils; leaves opposite; fruit not beaked . . . . **CALLITRICHACEAE** (p. 375).
Leaves usually much longer; flowers in spikes, or sometimes sessile in the leaf axils but the fruit then beaked.
POTAMOGETONACEAE (p. 278).

Plants not floating on or submerged in water . . . . . **B, BB.**

B. Leaves opposite or whorled (a few of the uppermost sometimes alternate); stems leafy.

Leaves toothed or lobed.

Stems with slender stinging hairs; flowers green, in cymes . . **URTICACEAE** (p. 326).

Stems without stinging hairs; flowers colored or, if green, not in cymes.

Flowers in a dense head surrounded by an involucre of bracts, the whole resembling a flower; stems not prostrate . . . . . **ASTERACEAE** (p. 419).

Flowers not in a head surrounded by bracts; stems sometimes prostrate.

Corolla none or of distinct petals.

Leaves deeply lobed . . . . . **GERANIACEAE** (p. 374).

Leaves merely toothed.

Corolla none; stems prostrate; juice milky . . **EUPHORBIACEAE** (p. 374).

Corolla present, white, green, pink, or purple; stems not prostrate; juice not milky.

Leaves thin, not evergreen; petals 2 or 5 . . . **ONAGRACEAE** (p. 378).

Leaves leathery, evergreen; petals 5 . . . . . **PYROLACEAE** (p. 388).

Corolla of united petals.

Leaves thick, evergreen; stems prostrate; flowers 2 at the end of a slender stalk . . . . . **Linnaea** (p. 412).

Leaves thin, not evergreen; stems usually erect; flowers not in twos.

Fruit a capsule; corolla 2-lipped . . . . **SCROPHULARIACEAE** (p. 403).

Fruit of 4 nutlets in the bottom of the calyx; corolla 2-lipped or regular.

Stems prostrate; leaves lobed . . . . . **VERBENACEAE** (p. 401).

Stems erect or nearly so; leaves toothed . . . . **MENTHACEAE** (p. 401).

Leaves entire.

Leaves in whorls of 3 or more, or else a single pair on the stem.

Leaves 2 on each stem.

Petals 3, very unlike, green; leaves oval, rounded, or kidney-shaped. **Ophrys** (p. 315).

Petals 5, all alike, pink; leaves lanceolate . . . . . **Claytonia** (p. 333).

Leaves 3 or more on each stem.

Flowers sessile in the leaf axils; leaves 6 to 12 in a whorl . . . **Hippuris** (p. 383).

Flowers not sessile in the leaf axils; leaves 3 to 6 in a whorl.

Stems bearing numerous whorls of leaves . . . . . **RUBIACEAE** (p. 411).

Stems bearing a single whorl of leaves.

Flowers in a dense head surrounded by 4 white petal-like bracts; leaves 4 to 6 . . . . . **Cornus** (p. 387).

Flower 1 on each stem, with 3 distinct petals; leaves 3 . . **Trillium** (p. 314).

Leaves opposite by twos, several pairs on each stem.

Plants parasitic upon the branches of trees . . . . . **LORANTHACEAE** (p. 438).

Plants growing on the ground.

Corolla of distinct petals or none.

Leaves very thick and fleshy . . . . . **CRASSULACEAE** (p. 352).

Leaves thin, not fleshy.

Petals yellow; leaves with black dots . . . . **HYPERICACEAE** (p. 376).

Petals never yellow; leaves not black-dotted.

Calyx and corolla absent; flowers sessile in the axils of the leaves. **CALLITRICHACEAE** (p. 375).

Calyx and usually a corolla present; flowers not sessile in the axils of the leaves.

Calyx borne on top of the ovary and fruit; petals 2 or 4. **ONAGRACEAE** (p. 378)

Calyx borne at the base of the ovary and inclosing the capsule; petals usually 5 . . . . . **SILENACEAE** (p. 333).

Corolla of united petals.

Fruit of 2 long pods; juice milky.

Pods glabrous; corolla bell-shaped; flowers in cymes.

APOCYNACEAE (p. 395).

Pods woolly; corolla flat, with reflexed lobes; flowers in umbels.

ASCLEPIADACEAE (p. 395).

Fruit not of 2 pods; juice not milky.

Corolla 2-lipped.

Fruit of 4 nutlets in the bottom of the calyx; corolla purple.

Prunella (p. 402).

Fruit a capsule; corolla variously colored.

SCROPHULARIACEAE (p. 403).

Corolla not 2-lipped, the lobes all alike.

Capsule 1-celled; corolla 15 to 40 mm. long, blue, purple, or lavender.

GENTIANACEAE (p. 394).

Capsule 3-celled; corolla 3 to 18 mm. long, white or purplish.

POLEMONIACEAE (p. 396).

BB. Leaves alternate or else all borne at the base of the stem, the stems often naked (one or two pairs of the lowest leaves rarely opposite).

Leaves evidently parallel-veined; petals and sepals, when present, 3 each (in a few plants the leaves are net-veined, but these are easily distinguished by the 3 petals).

Flowers sessile in dense globose heads . . . . . **SPARGANIACEAE** (p. 277).

Flowers not sessile in globose heads.

Flowers sessile in dense cylindric spikes, the lower part of the spike brown and velvety; plants about a meter high, with spongy linear leaves.

TYPHACEAE (p. 277).

Flowers not as above; plants various in habit.

Flowers sessile in a spike, this surrounded by a yellow hood-shaped corolla-like spathe, the whole appearing like a single flower; leaves all basal, 7 to 25 cm. wide . . . . . **ARACEAE** (p. 304).

Flowers never in a sessile spike surrounded by a spathe; leaves various.

Fruit a head of numerous small achenes; petals white; leaves arrow-shaped or ovate . . . . . **ALISMACEAE** (p. 279).

Fruit not a head of achenes; petals variously colored; leaves various but never arrow-shaped.

Petals unlike, one of them very different from the other two.

ORCHIDACEAE (p. 314).

Petals all alike.

Fruit of 3 to 6 distinct pods; flowers in loose racemes, the petals white.

SCHEUCHZERIACEAE (p. 279).

Fruit never of distinct pods; flowers various.

Petals (blue) and sepals borne at the top of the ovary; leaves with their edges turned to the stem; stamens 3; fruit dry.

IRIDACEAE (p. 314).

Petals and sepals borne at the base of the ovary; leaves usually with one face turned to the stem; stamens 6; fruit dry or juicy.

LILIACEAE (p. 308).

Leaves net-veined; sepals (always present) and petals (often absent) usually 4 or 5 each (leaves rarely appearing to be parallel-veined, but such plants never with 3 petals).
Plants without any green coloring; leaves all reduced to scales.
MONOTROPACEAE (p. 389).
Plants with green leaves.
C. Stems naked, the leaves all at the base of the flower-bearing stem (a whorl of leaflike bracts sometimes present at the base of the flowers in *Eriogonum*, a single small leaflike bract sometimes present on the stem in *Parnassia*).
Flowers in a dense head surrounded by an involucre of bracts; fruit an achene, usually with a tuft of bristles at the top.
Juice milky; flowers all with strap-shaped corollas.
CICHORIACEAE (p. 414).
Juice not milky; only the outer flowers of the head with strap-shaped (ray) corollas . . . . . **ASTERACEAE** (p. 419).
Flowers not in a head surrounded by bracts or, if sometimes appearing to be so, the perianth of distinct sepals; fruit never an achene with a tuft of bristles.
Leaves covered with long gland-tipped hairs; flowers in racemes.
DROSERACEAE (p. 352).
Leaves without gland-tipped hairs; flowers various.
Flowers in dense cylindric spikes; leaves with 3 or more ribs.
PLANTAGINACEAE (p. 411).
Flowers not in spikes; leaves not ribbed.
Corolla of united petals.
Flower one on each stem.
Corolla spurred, purple; leaves sessile . . . . . **Pinguicula** (p. 410).
Corolla not spurred, white; leaves slender-petioled.
Limosella (p. 406).
Flowers more than one on each stem.
Flowers in umbels; leaves longer than broad.
PRIMULACEAE (p. 393).
Flowers not in umbels; leaves as broad as long.
Romanzoffia (p. 398).
Corolla of distinct petals, or the flower without petals but with distinct colored sepals.
Petals none, the flowers with 6 sepals; flowers in clusters surrounded by an involucre of united bracts . . . . . **Eriogonum** (p. 326).
Petals present; sepals 4, 5, 8, or 10; flowers not in a cluster surrounded by an involucre.
Petals and sepals 8 or 10 each; leaves white-woolly beneath.
Dryas (p. 362) .
Petals and sepals 4 or 5 each; leaves not white-woolly beneath.
Petals and sepals each 4, inserted at the top of the ovary and fruit.
ONAGRACEAE (p. 378).
Petals and sepals each 5, not inserted at the top of the ovary and fruit.
Fruit of numerous achenes; petals yellow.
RANUNCULACEAE (p. 338).
Fruit a capsule; petals variously colored.
Petals yellow or violet, one of them spurred at the base.
VIOLACEAE (p. 377).
Petals white, greenish, or pink, none of them spurred.

Leaves thick, evergreen, usually finely toothed; stamens 10; capsule 5-celled; flowers one or several on each stem. **PYROLACEAE** (p. 388).
Leaves thin, not evergreen, entire; stamens 5, with clusters of sterile stamens between them; flower one on each stem. **PARNASSIACEAE** (p. 353).

CC. Stems leafy, usually with 2 or more leaves.
Flowers in heads surrounded by an involucre of bracts, the whole resembling a single flower (goldenrod, aster, dandelion, etc.).
Juice milky; flowers all with strap-shaped (ray) corollas. **CICHORIACEAE** (p. 414).
Juice not milky; only the outer flowers of the head, if any, with strap-shaped corollas . . . . . **ASTERACEAE** (p. 419).
Flowers not in heads surrounded by bracts.
Corolla of united petals.
Stems creeping, not twining; corolla about 3 mm. long; fruit fleshy. **Gaultheria** (p. 391).
Stems erect or rarely prostrate and trailing; corolla usually larger; fruit dry.
Fruit of 4 nutlets; leaves entire; corolla regular. **BORAGINACEAE** (p. 399).
Fruit a capsule; leaves entire, toothed, or lobed; corolla regular or 2-lipped.
Corolla 2-lipped or saucer-shaped . . **SCROPHULARIACEAE** (p. 403).
Corolla neither 2-lipped nor saucer-shaped.
Stamens protruding from the corolla; leaves entire or lobed. **Phacelia** (p. 398).
Stamens shorter than the corolla; leaves entire or toothed.
Leaves with 2 lobes at base, oblong or ovate; seeds 4. **CONVOLVULACEAE** (p. 396).
Leaves without lobes, mostly linear; seeds 3 or many.
Leaves entire; corolla tubular, about 1 cm. long, pink or pale purple, not drooping . . . . . **Collomia** (p. 397).
Leaves finely toothed; corolla bell-shaped, 15 to 20 cm. long, blue or bluish purple, drooping. **CAMPANULACEAE** (p. 414).
Corolla of distinct petals or often wanting, the calyx sometimes corolla-like.
Petals none, the calyx sometimes corolla-like.
Calyx inserted on the top of the ovary, white; leaves entire. **SANTALACEAE** (p. 326).
Calyx not inserted on the top of the ovary, variously colored; leaves entire, toothed, or lobed.
Fruit a head of numerous hairy achenes; sepals petal-like. **Anemone** (p. 343).
Fruit a capsule or a single achene; sepals various.
Fruit containing 2 or more seeds; leaves toothed or lobed.
Flowers in spikes; leaves woolly . . . . . **Synthyris** (p. 407).
Flowers in racemes; leaves not woolly . . . . . **Lepidium** (p. 345).
Fruit 1-seeded; leaves entire, toothed, or lobed.
Leaves with sheathing stipules; fruit often 3-angled. **POLYGONACEAE** (p. 326).
Leaves without stipules; fruit never 3-angled.
Fruit opening by a lid; bracts of the inflorescence with sharp spiny tips; leaves entire . . . **AMARANTHACEAE** (p. 332).
Fruit not opening by a lid; bracts rarely with sharp tips; leaves entire, toothed, or lobed . . **CHENOPODIACEAE** (p. 330).

Petals present.
Petals unlike, one of them with a spur at the base.
VIOLACEAE (p. 377).
Petals all alike or nearly so, none of them spurred.
Sepals 2; leaves fleshy . . . . . **PORTULACACEAE**(p. 332).
Sepals 4 or more or none; leaves fleshy or thin.
Petals blue; leaves entire . . . . . **LINACEAE** (p. 374).
Petals not blue; leaves entire, toothed, or lobed.
Leaves thick and fleshy, glabrous; fruit of 4 or 5 small pods.
CRASSULACEAE (p. 352).
Leaves thin, not fleshy, often hairy; fruit various.
Sepals and petals each 4.
Sepals inserted at the top of the ovary and fruit.
ONAGRACEAE (p. 378).
Sepals inserted at the base of the ovary and fruit.
BRASSICACEAE (p. 344).
Sepals and petals each 5 or more.
Flowers in umbels; leaves entire or toothed.
APIACEAE (p. 383).
Flowers not in umbels; leaves various.
Sepals inserted on the top of the fruit.
LOASACEAE (p. 378).
Sepals inserted at the base or at the side of the fruit.
Sepals distinct. Fruit of numerous achenes or of several. pods . . . . . **RANUNCULACEAE** (p. 338).
Sepals united at the base.
Fruit composed of numerous sections shaped like those of an orange, covered with long stiff hairs; petals 2 to 2.5 cm. long; stamens united into a column.
MALVACEAE (p. 376).
Fruit of 2 to 4 small, distinct or united pods, not long-hairy; petals 1 cm. long or less; stamens distinct.
SAXIFRAGACEAE (p. 353).

ANNOTATED CATALOGUE OF SPECIES.

1. OPHIOGLOSSACEAE. Adder's-tongue Family.

1. BOTRYCHIUM Swartz.

Plants with erect rootstocks and 1 or sometimes 2 leaves; roots fleshy; leaves not coiled in bud, composed of a sterile blade and one or more stalked spore-bearing panicles; sporangia (spore cases) capsule-like, opening by 2 valves.

Sterile blade once pinnate, the segments fan-shaped, entire or lobed . **1. B. lunaria.**
Sterile blade 3 to 5 times divided, the segments lanceolate to ovate, toothed or lobed.
Sterile blade sessile, thin . . . . . **2. B. virginianum europaeum.**
Sterile blade stalked, very fleshy. . . . . **3. B. silaifolium.**

1. Botrychium lunaria (L.) Swartz. MOONWORT. Rare; a few isolated plants found on grassy slopes, on mossy banks, and in bogs about Lake McDermott and Sun Camp; plentiful on the moraine at Grinnell Glacier. Alaska to Calif., Colo., N. Y., and Greenl.; also in the Old World.—Plants 5 to 15 cm. high; sterile blade sessile or nearly so, with 5 to 15 divisions, these thick and somewhat fleshy, the veins all radiating from the base and repeatedly forking.

The plants are probably of rather frequent occurrence, but they are so small and so hidden by grasses and other plants that it is difficult to find them.

2. Botrychium virginianum europaeum Ångstr. GRAPEFERN. Rare; in wooded swamps or in deep moist woods at low altitudes; abundant in an open mossy bog below Lake McDermott. The species widely distributed in N. Amer.; also in tropical Amer. and in the Old World.—Plants 10 to 50 cm. high; sterile blade broadly triangular.

In woods the leaves are deep green, but in the open they are yellowish green. The plants vary greatly in size. Only a few isolated individuals were found by the writer about Lake McDermott, except in one bog, where in the thick moss under scrub birches there were hundreds of plants.

3. Botrychium silaifolium Presl. LEATHERY GRAPEFERN. Rare; in a wet thicket below Lake McDermott, and in sphagnum bog at Johns Lake. Alaska to Calif. and Mont.; Wis. to Ont., Que., and Pa.—Plants 10 to 50 cm. high; sterile blade broadly triangular, thick and heavy, dark green.

The sterile blades persist for one or two years, and the species may be recognized easily by this fact.

2. POLYPODIACEAE. Polypody Family.

Plants consisting of a rhizome and leaves, the leaves coiled in bud; leaves simple, or compound and composed of leaflet-like pinnae; sporangia borne on the lower surfaces or along the margins of the leaves in clusters (sori); sori naked or with a special covering (indusium).

Leaves deeply lobed, the lobes entire. Sori dotlike, on the lower surface of the leaf. **1. POLYPODIUM.**

Leaves compound, composed of few or numerous pinnae.

Sori borne along the margin of the leaf and protected at first by the inrolled margin.

Sori distinct; leaf stalk divided above into 2 branches . . . . . **2. ADIANTUM.**

Sori not distinct, forming a continuous line about the margin; leaf stalk not 2-branched.

Leaves large, 20 to 60 cm. wide or larger, solitary . . . . . **3. PTERIDIUM.**

Leaves small, usually less than 10 cm. wide, commonly tufted.

Leaf stalks green or pale brown . . . . . **4. CRYPTOGRAMMA.**

Leaf stalks dark brown or nearly black . . . . . **5. CHEILANTHES.**

Sori borne on the lower side of the leaf, not at the margin.

Sori linear or oblong, straight or curved.

Leaves small, 4 to 15 cm. long, once pinnate; sori straight . . **6. ASPLENIUM.**

Leaves large, 25 to 100 cm. long or even larger, 2 or 3 times pinnate; sori curved. **7. ATHYRIUM.**

Sori rounded and dotlike.

Indusium attached by the middle beneath the sori or at one side.

Indusium attached by the middle, split into lobes; leaves with minute stalked glands . . . . . **10. WOODSIA.**

Indusium attached by one side, not lobed; leaves without glands. **11. FILIX.**

Indusium attached by the middle or by one side and spreading above the sorus, or the indusium sometimes wanting.

Indusium wanting.

Leaves much longer than broad, in dense clumps, from a very thick rootstock . . . . . **7. ATHYRIUM.**

Leaves about as broad as long, arising singly from a slender creeping rootstock . . . . . **9. DRYOPTERIS.**

Indusium present.

Leaves thick, evergreen, the teeth bristle-tipped; indusium round, attached by the center . . . . . **8. POLYSTICHUM.**
Leaves thin, not remaining green through the winter, the teeth scarcely or not at all bristle-tipped; indusium kidney-shaped, attached by its base . . . . . **9. DRYOPTERIS.**

1. POLYPODIUM L.

1. Polypodium hesperium Maxon. WESTERN POLYPODY. Occasional at low and middle altitudes, on shaded mossy rocks; more common on the east slope. Yukon to Calif., S. Dak., N. Mex., and Ariz.—Rootstocks slender, creeping; leaves 7 to 20 cm. long, the lobes blunt, the stalks straw-colored; sori large, rounded, without an indusium, borne on the lower leaf surface.

The rootstocks are sweet and have the flavor of licorice.

2. ADIANTUM L.

1. Adiantum pedatum aleuticum Rupr. MAIDENHAIR. Infrequent; chiefly above timber line, in crevices of cliffs or in soil at the foot of cliffs. Alaska to Calif., Utah, and Mont.; also in Que.—Leaves glabrous, composed of numerous small thin fan-shaped leaflets; leaf stalk very slender, brittle, dark chestnut-brown; sori at first covered by the reflexed lobes of the leaflets.

In many regions the maidenhair grows in rich woods, but in Glacier Park it is seldom found except upon cliffs.

3. PTERIDIUM Scop.

1. Pteridium aquilinum pubescens Underw. BRACKEN. Common and often abundant up to timber line; on open slopes or in dry or moist woods; sometimes in swampy thickets. Alaska to Mex.—Rootstocks slender, creeping; leaf stalks slender, pale, the leaves coarse and firm, somewhat triangular in outline, divided into numer ous narrow pinnules, these entire or lobed.

One of the most common ferns of the park, often densely covering considerable areas. On the west slope in wet places the plants get to be 1.5 meters high or even larger. In open places the leaves are frequently very pubescent, but in moist woods they are greener and nearly glabrous; in autumn they turn brown or bright yellow. The young stems were eaten by some of the western Indians.

4. CRYPTOGRAMMA R. Br.

Leaves much divided, glabrous, tufted, the sterile and fertile ones unlike, the ertile ones taller and with narrower divisions; sori marginal but extending down along the veins.

Leaves thin and delicate, the divisions of the sterile ones ovate to fan-shaped; leaf stalks brown or brownish below or throughout . . . . . **1. C. stelleri.**
Leaves firm, the divisions of the sterile ones ovate-oblong; leaf stalks straw-colored. **2. C. acrostichoides.**

1. Cryptogramma stelleri (Gmel.) Prantl. CLIFFBRAKE. Occasional in crevices of wet cliffs above timber line; abundant on wet mossy rocks at Baring Falls. Alaska to Lab., Pa., Colo., and Wash.; also in Asia.—Rootstocks slender, creeping; leaves pale green, usually 10 cm. long or shorter, 2 or 3 times divided, the pinnules finely toothed.

At Baring Falls the plants densely cover the overhanging cliffs in the spray of the falls; at high altitudes they are smaller and poorly developed. They usually have a pale, sickly appearance, and are not at all conspicuous.

2. Cryptogramma acrostichoides R. Br. PARSLEY FERN. Common on cliffs and rock slides at middle and high altitudes. Calif. to N. Mex., Sask., L. Huron, and

northward.—Leaves in large dense tufts, bright green, the fertile ones 10 to 30 cm. high, long-stalked, 3 or 4 times divided.

Sometimes associated with *C. stelleri* on cliffs above timber line, but more common on dry cliffs or on rocks slides at middle elevations.

5. CHEILANTHES Swartz.

Plants small; leaves 2 or 3 times divided, with small pinnules.

Leaves glabrous, the fertile and sterile ones somewhat dissimilar . . . **1. C. siliquosa.**
Leaves hairy and chaffy on the lower surface, the fertile and sterile ones alike.
2. C. gracillima.

1. Cheilanthes siliquosa Maxon. POD FERN. Rare; on dry open rocky slope near Many Glacier Chalets; reported from the Lake McDonald region. B. C. to Calif., Wyo., and Utah; also in Que. and Ont. (*Pellaea densa* Hook.)—Plants densely tufted, with slender wiry leaf stalks; leaves 6 to 20 cm. long, ovate or oblong-triangular, 3 times pinnate, with very numerous pinnules; fertile pinnules linear, with reflexed margins.

The fertile pinnules resemble the pods of some plants of the mustard family.

2. Cheilanthes gracillima D. C. Eaton. LACE FERN. Frequent on dry cliffs at middle altitudes, extending to timber line. B. C. to Mont., Nev., and Calif.—Leaves forming large or small tufts, 5 to 20 cm. long, narrowly ovate-lanceolate, usually bipinnate; pinnules covered beneath with branched scalelike hairs.

Plentiful on cliffs just below Sperry Chalets and near Many Glacier Chalets, as well as in various other localities. This fern has been reported from the park as *C. feei* Moore, a species not known to occur in the region.

6. ASPLENIUM L.

1. Asplenium viride Huds. GREEN SPLEENWORT. Scarce; on moist cliffs above timber line. Alaska to Ore., Wyo., Vt., and Newf.—Leaves tufted, 4 to 15 cm. long, bright green; pinnae 4 to 9 mm. long, rhombic, obtuse, with crenate margins.

An inconspicuous fern, more plentiful at Cracker Lake than at any other place at which it was observed by the writer.

7. ATHYRIUM Roth.

Plants large; leaves often densely tufted, 2 or 3 times pinnate.

Indusium none; sori rounded; plants usually forming large and very dense clumps.
1. A. americanum.
Indusium present and conspicuous; sori linear, curved; plants not in dense clumps.
2. A. filix-foemina.

1. Athyrium americanum (Butters) Maxon. ALPINE LADY FERN. Abundant in some localities above timber line; in moist meadows, along brooks, on rock slides, or rarely in crevices of cliffs. Alaska to Calif., Colo., and Mont.; also in Que. (*A. alpestre* of American authors.)—Rootstocks short; leaves erect, 25 to 60 cm. high, pale yellowish green, oblong-lanceolate, 2 or 3 times pinnate; pinnules lobed or cut, the lobes sharply toothed.

One of the most attractive of our ferns. The dense clumps are 30 to 100 cm. broad, and the leaves are so crowded that there scarcely seems to be room for one more. The clumps are usually isolated from other tall vegetation, and they always have a fresh appearance. The leaves have a slight balsamic odor. The most abundant display of this fern is on the slopes below Sperry Glacier, but it is plentiful near Grinnell Glacier and above Lake Ellen Wilson. In the last locality there are many clumps on the slides formed of bright red argillite rocks, and the combination of colors is very pleasing.

2. Athyrium filix-foemina (L.) Roth. LADY FERN. Abundant nearly everywhere in wooded portions of the park; most plentiful in deep moist woods, but found also in thickets or on open slopes, and frequently above timber line. Western N. Amer.,

Eur., and Asia. (*Asplenium filix-foemina* Bernh.)—Rootstock short-creeping; leaves in small clusters, 0.4 to 1.5 meters long, green, oblong-ovate to lanceolate; leaf stalks straw-colored or brownish, chaffy; pinnules cut or lobed, the lobes often toothed.

This is by far our most abundant fern, being found almost everywhere in the woods; on moist open slopes it often forms large dense patches to the exclusion of all other plants. It is so extremely abundant that one soon tires of it. The leaves vary greatly in width; in exposed places they are usually stiffly erect, but in deep shade they are more spreading. In late summer they are much discolored with dark spots. The sori vary in shape, being sometimes only slightly curved and in other cases nearly circular.

8. POLYSTICHUM Roth.

Plants large or small, the leaves tufted at the end of a thick rootstock; leaf stalks very chaffy; sori large, with a conspicuous indusium.

Leaves once pinnate, the pinnae 1 to 5 cm. long . . . . . **1. P. lonchitis.**
Leaves twice pinnate, the pinnae 4 to 10 cm. long . . . . . **2. P. andersoni.**

1. Polystichum lonchitis (L.) Roth. HOLLY FERN. Frequent in moist woods at middle altitudes and under shrubs above timber line. Alaska to Calif., Colo., Alta., N. S., and Greenl.—Leaves tufted, 10 to 40 cm. long, erect or spreading, the stalks covered with light brown scales; pinnae dark green, closely toothed, with spine-tipped teeth; sori borne chiefly or wholly on the upper pinnae.

Although the holly fern is widely distributed in the park it is rarely plentiful, and the plants are mostly scattered. They vary greatly in size, those above timber line often being much reduced. They are found occasionally in crevices of cliffs.

2. Polystichum andersoni Hopkins. BRISTLE FERN. Rare; in moist alder thickets at Grinnell Lake and along the upper trail from Many Glacier Hotel to Piegan Pass. B. C., Wash., and Mont.—Leaves tufted, erect, 35 to 75 cm. long; leaf stalks very chaffy; rachis of the leaf bearing a bud near the tip; pinnules with bristle-tipped teeth.

This is a handsome plant, and one of the rarest of North American ferns.

9. DRYOPTERIS Adans.

Plants large or small; leaves solitary or tufted, 2 or more times divided.

Rootstocks very slender, long and creeping; leaves solitary, broadly triangular, about as broad as long or broader; leaf stalk not chaffy, slender; indusium none. **1. D. linnaeana.**

Rootstocks very thick, short; leaves tufted at the end of the rootstock, much longer than broad, not triangular; leaf stalks very chaffy, stout; indusium present.
Leaves 3 times pinnate or lobed. Indusia very small . . . . . **2. D. dilatata.**
Leaves twice pinnate.
Pinnae triangular-oblong or triangular-ovate; scales at the base of the leaf stalk ovate-oblong . . . . . **3. D. cristata.**
Pinnae linear-lanceolate, with a broad base; scales lance-linear, long-pointed. **4. D. filix-mas.**

1. Dryopteris linnaeana C. Chr. OAK FERN. Common nearly everywhere in deep woods; in some localities very abundant. Alaska to Greenl., Va., Minn., Ariz., and Oreg.; also in Eur. (*Thelypteris dryopteris* Slosson; *Phegopteris dryopteris* Fée; *Dryopteris dryopteris* Christ.)—Leaves thin, 10 to 25 cm. wide, divided into 3 nearly equal parts, these once or twice pinnate, the segments oblong, entire or toothed.

In some places this fern covers large mossy banks with its graceful fronds; it is often associated with the lady fern and male fern. This species has been incorrectly reported from the park as *Phegopteris polypodioides* Fée.

2. Dryopteris dilatata (Hoffm.) Underw. WOOD FERN. Frequent in moist woods and in alder thickets; sometimes about sphagnum bogs. Alaska to Calif., Mont., N. C., and Greenl.; also in Eur. (*Aspidium spinulosum dilatatum* Hook.)—Leaves loosely tufted, 25 to 90 cm. high, pale green, triangular-ovate to broadly oblong; pinnules with short-pointed teeth.

Usually associated with the lady fern and male fern. The plants are mostly scattered, but in some localities they are abundant.

3. Dryopteris cristata (L.) A. Gray. CRESTED SHIELDFERN. Rare; under bushes at edge of sphagnum bog, Johns Lake. Idaho to Nebr., Va., and Newf. (*Aspidium cristatum* Swartz.)—Leaves densely tufted, 25 to 60 cm. long, the fertile ones much longer than the sterile ones; scales of the leaf stalk pale brown; segments of the leaf broad, oblong or triangular-oblong, obtuse, finely toothed.

4. Dryopteris filix-mas (L.) Schott. MALE FERN. Frequent in moist woods; sometimes on moist, open or brushy slopes, or even on rock slides; occasionally found above timber line. B. C. to Oreg., N. Mex., S. Dak., Vt., and Newf.; southern Calif.; also in Eur. (*Aspidium filix-mas* Swartz.)—Leaves tufted, deep green, rather firm, 25 to 100 cm. long, broadly oblong-lanceolate; pinnules toothed, especially at the apex.

Usually associated with the lady fern; a fine, handsome plant, the fronds usually stiffly erect.

10. WOODSIA R. Br. WOODSIA.

Leaves densely tufted, often forming large clumps, rather stiff, erect, pinnate, the pinnae deeply lobed and toothed.

Leaves with flat jointed whitish hairs on the lower surface . . . **1. W. scopulina.**
Leaves without jointed hairs . . . . . **2. W. oregana.**

1. Woodsia scopulina D. C. Eaton. Frequent on cliffs and rock slides. Alaska to Calif., N. Mex., and Nebr.; Que. and N. C.—Leaves 10 to 30 cm. long, lanceolate; pinnae oblong-ovate.

2. Woodsia oregana D. C. Eaton. East entrance, on rocky hills, *Umbach*. B. C. to Calif., Ariz., Sask., and Que.—Leaves 10 to 25 cm. long, lance-oblong; pinnae triangular-oblong.

11. FILIX Adans.

1. Filix fragilis (L.) Gilib. BRITTLE FERN. Frequent at nearly all altitudes, on cliffs or mossy banks. Widely distributed in N. Amer. and in the Old World. (*Cystopteris fragilis* Bernh.)—Leaves few, soft and lax, 10 to 30 cm. long, oblong-lanceolate, 2 or 3 times pinnate; pinnae ovate or lanceolate, irregularly lobed or toothed.

One of the most widely distributed of all ferns. The leaf stalks are very brittle. The brittle fern often grows with *Woodsia*, but it is easily recognized by the thin leaves, which are often pendent. The leaves, too, do not endure dry weather like those of *Woodsia*, but turn yellow and shrivel.

3. EQUISETACEAE. Horsetail Family.

1. EQUISETUM L. HORSETAIL.

Rushlike plants, simple or with whorled branches, with rootstocks, the stems hollow, jointed, with toothed sheaths at the nodes; spores borne in a terminal cone composed of shieldlike bracts.—The stems are roughened with a gritlike silex. They were formerly much used for scouring, hence the name scouring-rush, which is sometimes applied to the plants.

The following key to the species has been furnished by Dr. J. H. Schaffner.

Cones with a rigid point; aerial stems evergreen.
Sheath segments and deciduous teeth well differentiated; stems usually tall and rigid, usually many-grooved; central cavity of the internodes large.
Ridges of the stem with one row of tubercles; sheath segments without a central groove or sometimes with a minute groove, normally tricarinate.
1. E. praealtum.

Ridges of the stem with two rows of tubercles; sheath segments with a deep central groove, normally quadricarinate . . . . . **2. E. hyemale.**
Sheath segments and teeth not sharply differentiated, the base of the teeth usually persistent, but the bristle tip deciduous; stems low and slender, tufted, usually with 10 or fewer grooves, the central cavity only one-half to one-third the diameter of the internode . . . . . **3. E. variegatum.**
Cones rounded at the top or merely acute, not with a rigid point; aerial stems annual, not surviving the winter.
Aerial stems all green and essentially alike.
Fertile stems usually not branched, or the branches minute at time of maturing of the spores, very smooth, with cross bands of silex; sheaths elongate and dilated above, green, with a narrow black band at the top; plants of dry or ordinary wet soil . . . . . **4. E. kansanum.**
Fertile stems branched, usually with numerous whorls of branches; plants of wet soil, or growing in water.
Sheaths usually appressed; stems 45 to 90 cm. high, usually many-grooved, with a large central cavity in the internode . . . . . **5. E. fluviatile.**
Sheaths loose and somewhat dilated; stems 15 to 45 cm. high, slender, 5 to 15-grooved.
Central cavity of the internode very small; cones well developed.
6. E. palustre.

Central cavity about half the diameter of the internode; cones imperfectly developed . . . . . **7. E. litorale.**
Aerial stems of two kinds, the sterile shoots green and much branched, the fertile ones brown and, at least at first, with little or no chlorophyll.
Fertile shoots withering after the shedding of the spores, very rarely producing branches . . . . . **8. E. arvense.**
Fertile shoots producing compound branches after maturity of the spores, only the tips withering . . . . . **9. E. sylvaticum.**

1. Equisetum praealtum Raf. Occasional at low altitudes, in willow thickets or on rocky lake shores. B. C. to Calif., La., and Ohio.—Stems stout, 50 to 90 cm. high, with a large central cavity, very rough; sheaths ashy or black in age, usually with a black ring around the limb and a second one at the base, not dilated except when young; cones large and thick.

2. Equisetum hyemale L. Common at low altitudes, in swamps or wet thickets; sometimes on open, well-drained banks. Widely distributed in N. Amer., Eur., and Asia.—Stems stout, 0.5 to 1 meter high, very rough, with a large central cavity; sheaths close, ashy or black, usually black-banded.

3. Equisetum variegatum Schleich. Common, especially at middle altitudes and above timber line; about pools, on lake shores, along streams, and in wet meadows or thickets, often in sand or gravel. Alaska to Colo., N. Y., and Lab.; also in Eur. and Asia.—Stems slender, 10 to 30 cm. high, 2 to 4 mm. thick, tufted; sheaths loose, the teeth black, with a broad white border.

This species is particularly abundant in meadows above or near timber line, and often forms dense, almost pure stands of decumbent or ascending stems. Frequently it grows up to the very edges of the snow banks. Occasionally it is found in cultivated ground at low altitudes.

4. Equisetum kansanum J. H. Schaffner. Found only at the foot of Sherburne Lake, along a small gully in aspen woods. Mont. to Utah and Mo.—Stems 30 to 50 cm. high, rough, with a large central cavity; cones 1 to 2.5 cm. long.

5. Equisetum fluviatile L. Frequent at low and middle altitudes, in marshes, bogs, or swamps; in sphagnum bog at Fish Lake. Alaska to Wash., Wyo., N. Y., and Newf.; also in Eur. and Asia.—Stems smooth, bright green, the central cavity very large.

The stems are weak and sometimes procumbent. In the marshes along Swiftcurrent Creek below Lake McDermott this species is very abundant, growing in shallow water and forming dense pure stands, which at a short distance are strikingly suggestive of the similar colonies of *Scirpus occidentalis* found about the east entrance.

6. Equisetum palustre L. Apparently rare; a few plants at Belton, in sand along the river. Alaska to Oreg., Wyo., Conn., and Newf.; also in Eur. and Asia.—Stems slender, 20 to 40 cm. high, bright green, much branched, deeply grooved, the branches slender, simple.

7. Equisetum litorale Kuehlwein. Occasional at low altitudes, in wet ground or swampy thickets. B. C. to Pa. and N. B.; also in Eur.—Stems erect or decumbent, 20 to 40 cm. high, much branched, deeply grooved; sheaths with dark brown teeth; branches 3 to 5-angled.

This form is now believed to be a hybrid between *E. fluviatile* and *E. arvense*. Some of the material referred here may consist of sterile shoots of *E. arvense* with abortive cones.

8. Equisetum arvense L. Common and often abundant, at all altitudes except the highest; in wet meadows or thickets or along streams or lake shores; frequent on rocky slopes or in wet gravelly soil above timber line. Widely distributed in N. Amer., Eur., and Asia.—Sterile stems 10 to 30 cm. high, much branched, bright green, 6 to 20-grooved, deeply furrowed; sheaths of the fertile stems with about 12 teeth.

The fertile stems develop in early spring. In late summer the buds that produce them may be found about the bases of the sterile stems. Some of the plants above timber line, especially near snow banks, are nearly prostrate and are very sparsely branched. This species is common about the east entrance, extending out upon the prairie. It thrives particularly well upon railroad embankments, where dense patches grow from dry gravel and cinders.

9. Equisetum sylvaticum L. Rare on the east slope and found only in a boggy place in woods at the edge of Lake Josephine; occasional on the west slope at middle altitudes, in boggy places in woods. Alaska to B. C., Va., and Newf.; also in Eur. and Asia.—Stems 10 to 40 cm. high, 8 to 14-ridged, 3 to 4 mm. thick, the branches compound and feathery, bright green; cones long-stalked.

This is very different in appearance from our other species, and it is the only one which is at all attractive in appearance. The plants often form dense tangled masses.

4. LYCOPODIACEAE. Clubmoss Family.

1. LYCOPODIUM L. Clubmoss.

Low plants with leafy, simple or branched stems; leaves small, resembling those of cedar or juniper; spores in sporangia, or spore cases, these borne in the axils of ordinary leaves or in yellowish club-shaped spikes of reduced leaves.

Sporangia borne in the axils of ordinary leaves. Leaves rather closely appressed.
1. L. selago.

Sporangia borne in club-shaped spikes composed of much reduced leaves.
Fruit spikes not stalked.
Leaves arranged in 4 rows on the branches, bluish green, closely appressed.
2. L. alpinum.

Leaves in 6 or 8 rows, never bluish green, spreading.
Erect branches of plants treelike, with numerous small branches.
3. L. obscurum.
Erect branches of plants not treelike, with a few large branches.
4. L. annotinum.

Fruit spikes on stalks 2 cm. long or longer.
Leaves arranged in 4 rows, closely appressed to the stem, the branches thus appearing slender and flattened . . . . . **5. L. complanatum.**
Leaves in many rows, rather loose, the branches rounded . . . **6. L. clavatum.**

1. Lycopodium selago L. FIR CLUBMOSS. PLATE 45, A. Under bushes at Sperry Glacier and Gunsight Pass; in sphagnum bog at Johns Lake. Widely distributed in N. Amer. and Eur.—Stems erect, simple or sparsely branched, 10 to 20 cm. high; leaves hollow at the base.

Essentially an alpine species.

2. Lycopodium alpinum L. ALPINE GROUND-CEDAR. Under whortleberry bushes along the edge of a rock slide at Snyder Lake. Alaska and B. C. to Que. and Greenl.; also in Eur. and Asia.—Main stems creeping, the aerial branches 3 to 10 cm. high, branched.

A rare species, apparently; known in the United States only from this locality. The pale glaucous branches are strikingly like those of creeping cedar (*Juniperus prostrata*). In habit the plant is much like *L. complanatum*.

3. Lycopodium obscurum L. GROUND-PINE. In moss in deep woods at Belton. Alaska to Wash., Ind., Newf. and N. C.—Main stems creeping under the ground, the aerial branches erect, bushy, 10 to 20 cm. high; leaves dark green, twisted.

4. Lycopodium annotinum L. STIFF CLUBMOSS. PLATE 45, B. Common in deep moist woods, but more abundant on the west slope. Alaska to Oreg., Colo., Greenl., and Pa.—Main stems creeping above ground, leafy; aerial branches erect, 5 to 30 cm. high, simple or forked; spikes one to several.

This is the only clubmoss which is common on the east slope, and it is not certain that any other species occurs there. The plants usually form large mats of loosely tangled branches. Many of the plants are sterile.

5. Lycopodium complanatum L. GROUND-CEDAR. Common on the west slope at low altitudes, in deep moist woods; reported from Gunsight Lake. Alaska to Wash., Lab., and N. Y.; also in Eur.—Main stems creeping on or below the surface of the ground, the aerial branches pale green, 4 to 25 cm. high, forking.

The plants are very slender and creep widely over the ground; the branches are often much twisted.

6. Lycopodium clavatum L. RUNNING-PINE. PLATE 46, A. Johns Lake, about the edge of sphagnum bog. Alaska to Oreg., Newf., and N. C.; also in Eur. and Asia.—Main stems creeping over the ground, leafy; aerial branches rather thick, 5 to 20 cm. high, branched, densely covered with soft leaves; leaves mostly bristle-tipped.

Our form is *L. clavatum monostachyon* Hook. & Grev.

5. SELAGINELLACEAE. Selaginella Family.

1. SELAGINELLA Beauv.

Low perennial plants with branching stems; leaves 4 to 6-ranked, very small, imbricate, appressed; spores borne in sporangia sessile in the axils of leaflike bracts.—No species of the genus were seen on the west slope, but they are found almost everywhere on the east slope. The plants curl up in dry weather and lose their color, but

soon after a rain they become bright green. The well-known resurrection plant is a species of this genus which grows in Texas and Mexico.

Stems laxly cespitose, with numerous elongate ascending cordlike branches.
1. S. wallacei.

Stems densely cespitose, the branches short and congested.
Plants bronze-green; apical bristle stout, yellowish throughout . . . **2. S. standleyi.**
Plants ashy-green; apical bristle white, at least above the base.
Apical bristle 0.3 to 0.5 mm. long, white from a yellowish base . **3. S. montanensis.**
Apical bristle 0.6 to 1.5 mm. long, white throughout . . . . . **4. S. densa.**

1. Selaginella wallacei Hieron. Common or abundant on the east slope at low and middle altitudes and sometimes above timber line, on open, grassy or rocky slopes, on dry hilltops, and in dry meadows. B. C. to Calif. and Mont.—Stems 3 to 10 cm. long, loosely branched; leaves pale green at first, yellowish when dry, linear-oblong, 2.5 mm. long or shorter, with 7 to 12 cilia on each side; fertile spikes 1.5 cm. long or shorter.

2. Selaginella standleyi Maxon. Frequent above timber line, on moist open rocky slopes. Alta. and Mont.—Stems prostrate, 6 cm. long, or less, pinnately branched; leaves dull green, oblong-linear, 2.1 to 2.5 mm. long, with 10 to 14 cilia on each side; fertile spikes 7 to 11 mm. long.

3. Selaginella montanensis Hieron. Frequent at all altitudes, often occurring above timber line; on open rocky slopes or bare rocks or in moist alpine meadows. B. C. and Wash. to Mont. and Colo.—Stems prostrate, short-creeping, 3 to 10 cm. long; leaves pale glaucous when young, yellowish cinerascent in age, linear-oblong, with 6 to 9 cilia on each side.

4. Selaginella densa Rydb. Common at low altitudes, especially on prairie. B. C. to Utah and N. Mex.—Stems usually short and densely tufted; leaves pale green at first, dark grayish in age, linear-oblong, 2 to 3.5 mm. long, with 5 to 12 cilia on each side; spikes 1 to 3 cm. long.

On the dry rocky flats at St. Mary this is one of the most common plants, densely covering large patches of ground. The bristles of the apical leaves form conspicuous soft white tufts at the ends of the branches.

6. TAXACEAE. Yew Family.

1. TAXUS L.

1. Taxus brevifolia Nutt. WESTERN YEW. PLATE 47, A. Common on the west slope, at low and middle altitudes. Alaska to Calif. and Mont.—Usually a shrub, 1 to 4 meters high, but sometimes a small tree, the branches spreading from the base and often procumbent; bark brownish and smooth, or on old branches purplish and flaky; leaves 2-ranked, spreading, linear, sharp-pointed, 1 to 2 cm. long, yellowish green; fruit red, fleshy, cuplike, nearly inclosing the large naked seed.

This species reaches the eastern limit of its range in Glacier Park. It is one of the characteristic shrubs of the west slope, growing only in the heavier forest, where it often forms dense thickets, with young hemlocks. In its foliage the plant closely resembles the firs and spruces, but the fleshy fruit and small size, as well as the peculiar green of the leaves, enable one to distinguish it readily. The fruit is sweet and rather insipid. It is not advisable to eat much of it, for the yews have the reputation of being poisonous. Their poisonous properties are not well understood, however, and in many localities the trees are considered quite harmless, stock sometimes eating the branches with impunity. The fruit, too, is eaten by birds.

7. PINACEAE. Pine Family.

Trees or shrubs; leaves evergreen (except in *Larix*), needle-shaped, scalelike, or awl-shaped; stamens several together, subtended by a bract, forming catkins; fruit a dry cone or often fleshy and berry-like.

Leaves scalelike or awl-shaped, 1 cm. long or smaller, opposite or whorled.
Fruit a small dry cone; branchlets flattened; a large tree . . . . . **7. THUJA.**
Fruit berry-like; branchlets not flattened; small trees or low shrubs. **8. JUNIPERUS.**

Leaves linear or needle-like, usually much more than 1 cm. long, clustered or alternate.
Leaves in clusters of 2 or more.
Leaves 2 to 5 in a cluster, evergreen, the cluster surrounded by a sheath at the base; cones not with projecting scales . . . . . **1. PINUS.**
Leaves 15 to 40 in a cluster, deciduous, the cluster without a sheath; cones with scales projecting from between the hard bracts . . . . . **2. LARIX.**
Leaves attached singly to the branches.
Leaves sharp-pointed, 4-angled or rounded. Cones drooping, not falling apart at maturity; branches (from which the leaves have fallen) very rough; bark rough . . . . . **3. PICEA.**
Leaves blunt, flat.
Leaves sessile; cones erect, falling apart at maturity; bark smooth, with resin blisters . . . . . **4. ABIES.**
Leaves contracted at the base into a short stalk; cones drooping, not falling apart; bark very rough.
Leaves mostly 2 to 3 cm. long, green; branchlets smooth; cones 5 to 10 cm. long, with projecting 3-lobed bracts . . . . . **5. PSEUDOTSUGA.**
Leaves mostly 1 to 2 cm. long, whitish beneath; branchlets rough with the leaf bases left by the fallen leaves; cones 1.5 to 2.5 cm. long, without projecting bracts . . . . . **6. TSUGA.**

1. PINUS L. Pine.

Large trees, or near timber line often only shrubs, usually with rough bark; leaves long, needle-like; flowers appearing very early in spring; cones not maturing until the second season.

Leaves in clusters of 2 or 3; cone scales with short sharp spinelike tips.
Leaves 8 to 20 cm. long; cones 6 to 15 cm. long . . . . . **1. P. ponderosa.**
Leaves 3 to 6 cm. long; cones 3 to 4 cm. long . . . . . **2. P. contorta murrayana.**
Leaves in clusters of 5; cone scales without spinelike tips.
Bark whitish; low stunted tree or shrub, found only about timber line; cones 5 to 8 cm. long; leaves 4 to 6 cm. long . . . . . **3. P. albicaulis.**
Bark brown or blackish; usually large trees, most common far below timber line; cones 8 to 25 cm. long.
Tree low, with a heavy trunk and large top; cones not stalked, spreading, 7 to 20 cm. long, only about twice as long as thick; leaves 3.5 to 7 cm. long. **4. P. flexilis.**
Tree very tall and slender, with a small top; cones distinctly stalked, drooping, 15 to 25 cm. long, several times as long as thick; leaves 5 to 10 cm. long. **5. P. monticola.**

1. Pinus ponderosa Dougl. WESTERN YELLOW PINE. A few scattered trees about Lake McDonald; forming stands along the North Fork of the Flathead at low elevations. B. C. to S. Dak., N. Mex., and Mex. (*P. scopulorum* Lemmon.)—Large tree with tall heavy trunk covered with large reddish scales, the crown usually large but narrow; cones spreading.

The yellow pine is one of the common trees of the Rockies, and its scarcity about Glacier Park is due only to the high elevation of most of the country. It is one of the important lumber trees of the West.

2. Pinus contorta murrayana (Balf.) Engelm. LODGEPOLE PINE. Very abundant on the east slope at low altitudes and frequent at middle elevations; less common on the west slope, but widely distributed. Alaska to Calif., Colo., and Sask. (*P. murrayana* Balf.)—Small or large tree, the trunk covered with reddish brown scales, the top broad or narrow.

At low altitudes on the east slope this often forms dense pure stands, but at higher altitudes, and everywhere on the west slope, the trees are mixed with spruce, fir, and Douglas fir. The seedlings soon spring up abundantly in burnt-over areas, and the species is therefore a valuable means of reforestation. Lodgepole pine, however, has few attractive characteristics, and often seems more like a weed than a forest tree. No one who attempts to cross one of the slopes which are covered with fallen logs and a thick stand of the young trees will ever afterward be able to see anything attractive about this pine. One striking feature of the tree is found in the fact that the cones persist upon the branches for a long time, even after the trees are dead. In heavy timber the trunks are very tall and slender, and in the wind they sway in an alarming fashion. Indeed, the trees often do fall over and lodge against other trees, and it is this fact that has suggested the name "lodgepole."

3. Pinus albicaulis Engelm. WHITEBARK PINE. PLATE 38, A. Common about timber line, associated with alpine fir. Alta. and B. C. to Calif. and Wyo. (*Apinus albicaulis* Rydb.)—Low tree or more often a shrub, the branches often prostrate upon the ground; bark only slightly fissured or smooth; cones purplish, not stalked, remaining closed when mature.

The species is confined to a narrow belt about timber line.

4. Pinus flexilis James. LIMBER PINE. Occasional at nearly all altitudes, usually on exposed slopes or mountain tops. Alta. to Calif. and Tex. (*Apinus flexilis* Rydb.)—Heavy tree, usually 10 to 15 meters high, with rough bark.

In some localities the limber pine forms small groves, but usually it is associated with other trees. Some very large trees grow about Granite Park. In exposed places the trees are often lopsided, and frequently the trunks are deformed. On the slopes above Many Glacier Chalets there are numerous dwarfed and gnarled individuals that suggest the trees which are artificially dwarfed by Japanese gardeners. About Sun Camp the limber pine grows with the lodgepole pine, and one scarcely recognizes that there are two species until the number of leaves in a cluster is noticed. This tree is often known in the West as white pine.

5. Pinus monticola Dougl. WESTERN WHITE PINE. Common on the west slope at low and middle altitudes, mixed with other trees. B. C. to Calif. and Mont. (*Strobus monticola* Rydb.)—Trunk often 30 meters high, covered with brown or grayish purple bark broken into small blocks; crown short and narrow; leaves bluish green.

This is by far the finest pine of the park, and the clean, slender, symmetric trunks have a very attractive appearance. The handsome cones are abundant on the ground along the trails, and often appear to be strangely out of place, for the tops of the trees are so high above one's head that they are not noticed. The tree reaches the eastern limit of its range in Glacier Park.

2. LARIX Adans. LARCH.

Large or small trees with rough bark; leaves resembling those of pines, but shorter, soft, and deciduous; cones short-stalked or sessile; seeds winged.

Branchlets glabrous or nearly so . . . . . 1. L. occidentalis.
Branchlets very hairy . . . . . 2. L. lyallii.

1. Larix occidentalis Nutt. WESTERN LARCH. Abundant on the west slope at low and middle altitudes. B. C. to Oreg. and Mont.—Large tree, often 30 meters high or more; bark bright reddish brown, deeply furrowed at the base of the trunk, but only slightly furrowed above; leaves 3 to 5 cm. long; cones 3 to 4 cm. long.

Often known as tamarack. Western larch appears to be absent on the east slope, but soon after crossing the pass, along the railroad, it becomes a conspicuous feature of the lansdcape. About Belton it is the most abundant tree, and it is common all about Lake McDonald and well up toward Sperry Chalets. It reproduces abundantly, and in many places the young trees form dense, almost impenetrable thickets. The leaves turn bright yellow in late summer. The wood is valuable for lumber. The species reaches the eastern limit of its range in Glacier Park.

2. Larix lyallii Parl. ALPINE LARCH. Said to grow in a few places about timber line, but not seen by the writer. Alta. and B. C. to Oreg. and Mont.—A small, often stunted tree, with slightly furrowed bark; leaves 3 to 4 cm. long; cones 4 to 5 cm. long.

3. PICEA Link. SPRUCE.

Large trees with dark rough bark and narrow crowns; leaves pointing in all directions, stiff; cones maturing the first season, the scales thin; seeds with thin wings.

Twigs glabrous . . . . . 1. P. canadensis.
Twigs finely hairy . . . . . 2. P. engelmanni.

1. Picea canadensis (Mill.) B. S. P. WHITE SPRUCE. Frequent at middle altitudes. Alaska to Lab., N. C., Wis., Wyo., and B. C.—Tree 10 to 20 meters high, with dark scaly bark; leaves bluish green, 1.5 to 2.5 cm. long, curved; cones 3 to 5 cm. long, the scales entire or finely toothed.

2. Picea engelmanni (Parry) Engelm. ENGELMANN SPRUCE. Common, especially on the east slope, at middle altitudes. B. C. and Yukon to N. Mex. and Ariz.—Large tree, often 25 to 30 meters high, with a narrow pyramidal crown composed of short branches; bark dark purplish brown, with small loose scales; leaves 2 to 3 cm. long, bluish green; cones 3 to 6 cm. long.

Engelmann spruce is usually associated with fir and Douglas fir, but occasionally it forms almost pure stands. It is a very handsome tree.

4. ABIES Hill. FIR.

Large or small trees; leaves leaving rounded scars on the twigs, each leaf with 2 longitudinal resin ducts and a solitary fibro-vascular bundle; cones maturing the first year; seeds winged.—The trees of this genus are often known as balsam firs.

Leaves of the lowest branches arranged in 2 rows (on two sides of the twigs), usually notched at the end; resin ducts of the leaves (as seen in cross section) close to the epidermis on the lower side . . . . . 1. A. grandis.
Leaves more or less crowded on the upper sides of the twigs, not notched at the end; resin ducts within the soft tissue of the leaf, remote from the epidermis. 2. A. lasiocarpa.

1. Abies grandis Lindl. GREAT SILVER FIR. Occasional on the west slope at low altitudes. B. C. to Calif., Wyo., and Mont.—Large tree, often 50 to 75 meters high; twigs finely hairy or glabrous; leaves 2 to 5 cm. long, green above, white beneath; cones 5 to 10 cm. long.

2. Abies lasiocarpa (Hook.) Nutt. ALPINE FIR. Common about timber line, and on the east slope at middle altitudes; infrequent on the west slope. Alaska to Oreg., N. Mex., and Alta.—Tree, often 30 meters high, at timber line stunted and usually a shrub, often with long prostrate branches; trunk short, the crown (at low altitudes) long, narrow, and pointed; leaves blue-green, 2.5 to 4 cm. long; cones 5 to 10 cm. long, purplish.

Associated on the east slope with spruces and Douglas fir. The firs are easily recognized in the heavy timber by their smooth, pale bark, all our other evergreen trees (except whitebark pine) having rough, dark bark.

The Blackfoot Indians used the resin for incense in their ceremonials, for perfume, for poultices in the treatment of fevers and colds, and, when mixed with grease, as hair oil.

5. PSEUDOTSUGA Carr.

1. Pseudotsuga mucronata (Raf.) Sudw. DOUGLAS FIR. Common in the forested areas of both slopes, nearly throughout the timber belt. B. C. and Alta. to Mex. (*P. taxifolia* Britton.)—A large tree with heavy trunk covered with deeply furrowed, dark brown bark; crown pyramidal and sharp-pointed or sometimes broad and rounded; lower branches often drooping and with long pendent side branches; cones maturing the first year.

Sometimes known as red fir or Douglas spruce. Excepting only the giant sequoias of California, this is the largest tree of the United States, but in Glacier Park the trees do not attain the size of those which grow in the humid regions of the Pacific coast. In some places within the park there are large trees, especially about St. Mary, where there are dense stands. Near timber line Douglas fir is often stunted and shrubby, but these low shrubs are sometimes loaded with cones. A striking feature of this tree is its habit of bearing cones on the lower as well as on the upper branches; in the firs and spruces the cones are borne only near the top of the tree. Very young plants at low altitudes sometimes bear cones. In late summer cones cut from the trees by squirrels are plentiful on the ground.

6. TSUGA Carr.

1. Tsuga heterophylla (Raf.) Sarg. WESTERN HEMLOCK. Abundant on the west slope at low altitudes. B. C. to Calif. and Mont.—Large tree with gradually tapering trunk, covered with dark brown, somewhat reddish, ridged bark; crown usually narrow and pointed, the branches with slender drooping branchlets; leaves soft, apparently 2-ranked; cones maturing the first year.

The tree reaches the eastern limit of its range here. It grows mixed with giant cedar, white pine, Douglas fir, and larch. Seedlings are abundant in the heavy forest and often form dense underbrush in association with the yew.

7. THUJA L.

1. Thuja plicata Don. GIANT CEDAR. Abundant on the west slope at low altitudes about Lake McDonald; isolated trees are said to occur on the east slope, and the writer found seedlings near Sun Camp. Alaska to Calif. and Mont.—Large tree, sometimes 50 meters high; bark reddish brown, shallowly furrowed, easily separating into long shreds; lower branches drooping; leaves scalelike, 4-ranked, about 3 mm. long; cones about 12 mm. long.

The dense stands of giant cedar at the head of Lake McDonald are one of the finest sights of the park. The graceful branches suggest the fronds of some giant fern. On young trees and on the smaller branches the bark is quite smooth. Small saplings often bear cones. Giant cedar is sometimes known as arbor-vitae; the cultivated arbor-vitae is a closely related species of eastern North America.

8. JUNIPERUS L.

Trees or shrubs; leaves scalelike or awl-shaped, opposite or in whorls of 3; pistillate and staminate flowers borne on the same or separate plants; cones berry-like, with resinous flesh.

Plants trees or large erect shrubs. Leaves scalelike, 1 to 1.5 mm. long.
1. J. scopulorum.

Plants low, spreading or creeping shrubs.
Leaves scalelike, 1 to 1.5 mm. long, opposite, appressed to the branchlets.
2. J. horizontalis.

Leaves awl-shaped, 5 to 10 mm. long, in whorls of 3, spreading . . **3. J. sibirica.**

1. Juniperus scopulorum Sarg. WESTERN RED CEDAR. Occasional at low altitudes on the west slope, in rocky places. B. C. and Alta. to Tex. and Ariz. (*Sabina scopulorum* Rydb.)—Small tree or shrub, with fissured brown bark and rounded or pointed crown; leaves opposite; fruit dark blue.

Small trees grow along the river at Belton.

2. Juniperus horizontalis Moench. CREEPING CEDAR. Common on the east slope in open places up to timber line or even above. B. C. to Wyo., Minn., N. Y., and N. S. (*Sabina horizontalis* Rydb.)—Prostrate shrub, often forming great mats; leaves green or bluish; fruit dark blue, 1 to 3-seeded.

This species is most abundant at low altitudes; at St. Mary it forms great carpets over the flats, the branches usually lying close against the ground. On shale slopes of a canyon near the east entrance two forms of this plant were observed, one with bright green leaves, the other with bluish leaves. At a short distance the difference in color was very striking.

3. Juniperus sibirica Burgsd. GROUND JUNIPER. Common in woods or on open slopes up to, and sometimes above, timber line; most abundant on the east slope-Alaska to Calif., N. Y., and Lab.; also in Asia.—Prostrate or spreading shrub, some. times a meter high, usually forming broad clumps or carpets; leaves sharp-pointed, twisted at the base, white on the upper surface; fruit pale blue, 1 to 3-seeded.

Perhaps only a form of *J. communis* L. On exposed slopes, at either high or low elevations, the plants are often prostrate, and form extensive slippery mats over which it is difficult to climb. Ground juniper frequently grows with creeping cedar.

8. TYPHACEAE. Cat-tail Family.

1. TYPHA L.

1. Typha latifolia L. CAT-TAIL In small ponds or pools about the east entrance. Widely distributed in N. Amer. and in the Old World.—Plants perennial, usually about a meter high; leaves linear, 5 to 25 mm. wide, glabrous, spongy; flowers small, consisting of stamens and a pistil surrounded by bristles, crowded in a very dense, cylindric spike; staminate flowers borne in the upper part of the spike, the dark brown pistillate flowers in the lower part.

9. SPARGANIACEAE. Bur-reed Family.

1. SPARGANIUM L. BUR-REED.

Glabrous perennial aquatic plants with rootstocks; leaves linear; flowers green, in dense spheric heads, the pistillate and staminate ones in separate heads; fruit nutlike, containing 1 or 2 seeds.

Leaves mostly 5 to 10 mm. wide; fruit heads about 2 cm wide; fruit gradually tapering into a beak . . . . . **1. S. multipedunculatum.**
Leaves 3 to 4 mm. wide; heads about 1.5 cm. wide; fruit abruptly beaked.
2. S. angustifolium.

1. Sparganium multipedunculatum (Morong) Rydb. Occasional at low and middle altitudes, about ponds. B. C. to Calif., Colo., and Ont.—Leaves 20 to 50 cm. long; fruit heads 2 to 6, the lower ones stalked.

2. Sparganium angustifolium Michx. Frequent at low and middle altitudes, in lakes, ponds, or slow-flowing streams. B. C. to Calif., N. Mex., Pa., and Newf.—Plants slender, the leaves usually floating, 30 to 60 cm. long; fruit heads 2 to 4, sessile or the lowest one stalked.

10. POTAMOGETONACEAE. Pondweed Family.

Aquatic perennials with slender, usually branched stems; leaves broad or narrow; flowers very small, green, in axillary clusters or spikes; petals and sepals none; fruit a small achene or drupelet.

Leaves opposite; flowers sessile in the leaf axils; fruit with a long slender beak.
1. ZANNICHELLIA.
Leaves alternate; flowers in spikes; fruit with a very short beak.
2. POTAMOGETON.

1. ZANNICHELLIA L.

1. Zannichellia palustris L. HORNED PONDWEED. Collected in pools at east entrance by Umbach. Widely distributed in N. Amer. and the Old World.—Stems very slender, submerged; leaves threadlike, 3 to 6 cm. long, 0.5 mm. wide or less, 1-nerved; fruit 2 to 6 mm. long.

2. POTAMOGETON L. PONDWEED.

Leaves often of two kinds, some floating and some submerged, with stipules.—It is probable that several other species besides those listed below occur in the park, for the writer was unable to make very extensive collections. The water in many of the lakes appears to be too cold for the growth of the plants, but they are plentiful in Lake McDonald and St. Mary Lake.

Plants with both floating and submerged leaves.
Floating leaves mostly 1.5 to 4 cm. long . . . . . **1. P. heterophyllus.**
Floating leaves mostly 5 to 12 cm. long.
Submerged leaves without blades . . . . . **2. P. natans.**
Submerged leaves with large blades . . . . . **3. P. amplifolius.**
Plants with submerged leaves only.
Leaves lanceolate or linear-lanceolate, many-nerved, 8 to 30 mm. wide.
Leaves sessile or short-petioled, not clasping . . . . . **4. P. lucens.**
Leaves clasping . . . . . **5. P. richardsonii.**
Leaves linear or threadlike, few-nerved, 3 mm. wide or less.
Stipules free from the petioles and blades.
Leaves with 2 glands at the base, 1 to 1.5 mm. wide . . . . . **6. P. pusillus.**
Leaves without glands, 2 to 4 mm. wide . . . . . **7. P. compressus.**
Stipules united with the bases of the leaves.
Leaves linear, about 1 mm. wide . . . . . **8. P. interior.**
Leaves threadlike, 0.5 mm. wide or less . . . . . **9. P. pectinatus.**

1. Potamogeton heterophyllus Schreb. Fish Lake. B. C. to Calif., Fla., and Lab.; also in Eur.—Floating leaves oval, green, 9 to 19-nerved; submerged leaves linear or linear-lanceolate, 2 to 12 mm. wide.

2. Potamogeton natans L. Small pond along trail to Avalanche Lake. Widely distributed in N. Amer., Eur., and Asia.—Floating leaves oval or ovate, 5 to 10 cm. long, rounded at the apex, usually subcordate at base, thick, 21 to 29-nerved.

3. Potamogeton amplifolius Tuckerm. Fish Lake. B. C. to N. B. and Ga.—Floating leaves oval or ovate, usually acute, rounded or subcordate at base, 6 to 15 cm. long; submerged leaves lanceolate or elliptic, ruffled, thin.

The plants are abundant in Fish Lake, in shallow or deep water, and some of the stems must be several meters long.

4. Potamogeton lucens L. Swiftcurrent Creek below Lake McDermott; pools at St. Mary. Widely distributed in N. Amer. and Eur.—Plants reddish or brownish; leaves 6 to 15 cm. long, 1 to 4 cm. wide, acute or obtuse, thin.

5. Potamogeton richardsonii (A. Benn.) Rydb. Pond near east entrance, *Umbach*. Alaska to Calif., Wyo., Del., and N. Y.—Leaves lanceolate, 5 to 10 cm. long, acute or acuminate, 13 to 23-nerved, thin.

6. Potamogeton pusillus L. Swiftcurrent Creek below Lake McDermott. Widely distributed in N. Amer. and Eur.—Stems very slender; leaves 2 to 10 cm. long, 1 or 3-nerved.

7. Potamogeton compressus L. Fish Lake. B. C. to Oreg., N. J., and N. B.; also in Eur.—Stems slender, flattened; leaves thin, 5 to 20 cm. long, 3-nerved.

8. Potamogeton interior Rydb. Swiftcurrent Creek below Lake McDermott. Mont. to N. Mex. and Ont.—Stems slender, much branched, very leafy; leaves 3 to 15 cm. long, 1-nerved.

9. Potamogeton pectinatus L. Ponds at east entrance, *Umbach*. Widely distributed in N. Amer. and Eur.—Stems much branched, very leafy; leaves 3 to 15 cm. long, very slender.

11. SCHEUCHZERIACEAE. Scheuchzeria Family.

1. SCHEUCHZERIA L.

1. Scheuchzeria palustris L. In sphagnum bogs at Johns and Fish lakes, and probably elsewhere on the west slope. Alaska to Calif., N. J., and Lab.; also in Eur. and Asia.—Glabrous perennial, 10 to 25 cm. high; leaves linear, 10 to 30 cm. long; flowers white, the 6 segments about 3 mm. long; stamens 6; fruit of 3 to 6 spreading pods about 5 mm. long.

12. ALISMACEAE. Waterplantain Family.

Glabrous perennials with naked stems; leaves long-petioled, parallel-veined but with numerous cross veins; flowers white, long-stalked, whorled, in racemes or panicles; petals 3; fruit of numerous achenes.

Leaves arrow-shaped, with sharp lobes at the base; achenes in several series on a convex receptacle . . . . . **1. SAGITTARIA.**

Leaves oblong or ovate, never with lobes; achenes in a ring on a flat receptacle. **2. ALISMA.**

1. SAGITTARIA L.

1. Sagittaria cuneata Sheld. ARROWHEAD. Low places on prairie at east entrance. B. C. to Calif., N. Mex., N. Dak., Conn., and Me.—Plants 20 to 40 cm. high, with spongy stems and petioles; leaves 6 to 15 cm. long, with 2 long basal lobes; flowers in racemes, the lower ones pistillate, the upper ones staminate; petals about 1 cm. long; fruit heads 1 to 1.5 cm. in diameter, the achenes with a short beak.

2. ALISMA L.

1. Alisma brevipes Greene. WATERPLANTAIN. Low places on prairie at east entrance. B. C. to Calif., N. Mex., N. Dak., and N. S.—Plants 20 to 60 cm. high; leaves 5 to 15 cm. long, acute or obtuse, rounded or subcordate at base; petals 5 to 6 mm. long; fruit heads 5 to 7 mm. broad.

This may be the same as the Old World *A. plantago-aquatica* L. The common plant of eastern North America is a distinct species.

13. POACEAE. Grass Family.

Annual or perennial herbs, with round or flattened, jointed stems (*culms*), closed at the nodes and hollow between them; leaves parallel-veined, 2-ranked, consisting of a sheath, enveloping the culm like a split tube, and a blade, usually linear; flowers minute, arranged in spikelets, these consisting of a series of 2-ranked bracts, the lower pair (*glumes*) empty, the others (*lemmas*) bearing the minute flowers surrounded by a second 2-nerved bract (*palea*) in their axils (lemma, palea, and flower termed the *floret*); spikelets with 1 to many florets, borne in spikes or panicles.—The lemmas are variously modified. They may contain no flower (being *sterile*) or may be greatly reduced. The palea, also, is sometimes reduced or obsolete. The cultivated grains—wheat, rye, barley, oats, and corn, as well as bluegrass and timothy—belong to this family.

Spikelets ovate, blunt, nearly sessile, subtended by bristles, borne in a compact spikelike panicle . . . . . **1. CHAETOCHLOA.**

Spikelets more or less compressed, not subtended by bristles. (In the barley-grasses the bristles are the glumes, that is, part of the spikelet itself.)

Spikelets absolutely sessile on the axis, forming spikes (the rudimentary spikelets in *Hordeum* pedicellate, but the central fertile spikelet sessile).

Spikes several, racemose on a main axis and appressed to it; spikelets small, flat, somewhat heart-shaped, borne on one side of the axis; sheaths not auricled. **17. BECKMANNIA.**

Spikes solitary; spikelets borne on opposite sides of the axis, they, or their parts, pointed or awned; sheaths with a pair of spreading auricles at the summit.

Axis disjointing with the spikelets attached; spikelets borne 3 together, the central one 1-flowered, fertile, the lateral ones reduced to awns, pedicellate. **28. HORDEUM.**

Axis not disjointing; spikelets 3 to 8-flowered, all sessile.

Spikelets borne 2 or 3 together (or the upper and lower ones of the spike sometimes solitary) . . . . . **29. ELYMUS.**

Spikelets borne singly.

Plants annual; glumes ovate . . . . . **27. TRITICUM.**

Plants perennial; glumes narrowly lanceolate or subulate. **26. AGROPYRON.**

Spikelets on long or short pedicels, often in spikelike panicles but never in one-sided spikes or on opposite sides of the main axis.

Fertile floret with a pair of sterile or rudimentary florets below and falling with it.

Panicle contracted, dense; sterile florets reduced to minute obscure lemmas; plant odorless . . . . . **2. PHALARIS.**

Panicle open; sterile florets as large as the fertile one; plant strongly fragrant. **3. TORRESIA.**

Fertile florets with no sterile florets below them, sometimes with sterile florets above.

Spikelets 1-flowered.

Lemma indurate, the nerves obscure, awned from the tip, the awn much longer than the body.

Awn twisted; base of floret sharp-pointed; flowering culms erect, leafy. **4. STIPA.**

Awn not twisted; base of floret blunt; flowering culms decumbent, naked, the sheaths bladeless, the sterile shoots erect, with long blades. **5. ORYZOPSIS.**

Lemma membranaceous, awnless or minutely awn-tipped or awned from the back.

Panicles cylindric or nearly so, dense, spikelike. Glumes exceeding the florets.
Glumes awn-tipped, stiffly ciliate on the keel; panicle harsh to the touch . . . . . **7. PHLEUM.**
Glumes not awn-tipped, silky-ciliate on the keel; panicle soft and silky to the touch . . . . . **8. ALOPECURUS.**
Panicles open or contracted, but not subcylindric.
Glumes shorter than the floret. Panicle very slender, contracted; plants low and wiry . . . . . **6. MUHLENBERGIA.**
Glumes as long as the floret or exceeding it.
Spikelets falling entire; panicle open, drooping. Florets without silky hairs at base . . . . . **9. CINNA.**
Spikelets not falling entire, the florets falling from the persistent glumes.
Florets without silky hairs at base or with very obscure ones. **10. AGROSTIS.**
Florets with copious silky hairs at base; lemmas awned from the back . . . . . **11. CALAMAGROSTIS.**
Spikelets 2 to many-flowered.
Glumes equaling or exceeding all the florets; lemmas awned from the back or from between the teeth of the prominently 2-toothed apex (the awn often obsolete in *Trisetum wolfii*).
Spikelets not over 8 mm. long; awn delicate.
Lemmas rounded on the back, dentate at the broad summit . **12. AIRA.**
Lemmas keeled on the back, the apex acute, 2-toothed. **13. TRISETUM.**
Spikelets 12 mm. or more long; awns stouter.
Spikelets about 3 cm. long; lemmas over 12 mm. long, awned from the back, the awn not flattened . . . . . **15. AVENA.**
Spikelets mostly 12 to 15 mm. long; lemmas not over 8 mm. long, awned from between two long teeth, the awn flattened and twisted below. **16. DANTHONIA.**
Glumes not exceeding the lowest floret; lemmas awnless or awned from the apex or from just below it.
Lemmas broad at the summit, the nerves not converging at the apex.
Spikelets 2-flowered; lemmas prominently 3-nerved. **18. CATABROSA.**
Spikelets 4 to 8-flowered; lemmas 5 to 7-nerved.
Lemmas indistinctly nerved . . . . . **23. PUCCINELLIA.**
Lemmas very strongly nerved . . . . . **22. PANICULARIA.**
Lemmas acute, pointed or awned, the nerves converging toward the apex.
Lemmas keeled on the back, awnless.
Spikelets 10 to 15 mm. long; lemmas firm, finely and obscurely many-nerved; plants dioecious . . . . . **20. DISTICHLIS.**
Spikelets mostly less than 8 mm. long; lemmas membranaceous, 5-nerved; spikelets perfect.
Second glume noticeably larger than the first; culm pubescent below the panicle; blades not boat-shaped at the tip. **14. KOELERIA;**
Second glume scarcely larger than the first; culm not pubescent. blades boat-shaped at the tip . . . . . **21. POA.**
Lemmas rounded on the back, or slightly keeled toward the summit only, awned or awnless.

Glumes papery; lemmas firm, scarious-margined; upper florets sterile, folded together, forming a club-shaped rudiment behind the uppermost palea . . . . . **19. MELICA.**
Glumes not papery; upper florets similar to the others.
Lemmas entire, awned from the tip or pointed . . **24. FESTUCA.**
Lemmas awned or awn-tipped from a minutely 2-toothed apex. **25. BROMUS.**

1. CHAETOCHLOA Scribn.

1. Chaetochloa viridis (L.) Scribn. GREEN FOXTAIL. Dry gravel bank, Belton, only one or two plants seen. Native of Eur.; naturalized in N. Amer.—Plants annual, 30 to 50 cm. tall, with flat blades about 1 cm. wide and a single dense green bristly head 3 to 10 cm. long.

2. PHALARIS L. CANARY GRASS.

1. Phalaris arundinacea L. East entrance, in wet soil. B. C. to Nev., N. J., and N. S.; also in Eur. and Asia.—Plants perennial, with running rootstocks, pale green, 1 meter or more tall, the culms simple, with drooping blades 1 to 2 cm. broad, and a pale dense narrow panicle 8 to 15 cm. long; spikelets flattened, the glumes keeled and abruptly pointed, the hard, shining, flat, minutely pubescent fruits readily shelling out.

3. TORRESIA Ruiz & Pav.

1. Torresia odorata (L.) Hitchc. VANILLA GRASS. Meadows about the east entrance, and doubtless elsewhere. Alaska to N. Mex., N. J., and Lab.; also in Eur. and Asia. (*Hierochloa odorata* Wahl.; *Savastana odorata* Scribn.)—Plants perennial, with brownish rootstocks, growing in small colonies, the simple culms 30 to 50 cm. tall, with soft flat blades and an open panicle 5 to 8 cm. long with spreading or drooping branches and broad, shining, pale bronze spikelets.

Known also as holy grass, Seneca grass, and sweetgrass. The entire plant is fragrant, even when dry. The fragrant grass baskets woven by the Indians are made from this species. The Blackfoot Indians used the grass as incense in some of their ceremonials, and a decoction of it was employed as a hair tonic. The Sweetgrass Hills, which lie east of the park, derive their name from the plant.

4. STIPA L. PORCUPINE GRASS.

Erect perennial bunchgrasses with simple culms, narrow blades, and terminal panicles; glumes thin; longer than the body of the terete (nearly cylindric) floret; awn 3 to 5 times as long as the body, twice bent.

Panicle open, the branches spreading or drooping . . . . . **1. S. richardsonii.**
Panicle narrow, the short branches erect.
Sheaths hairy at the throat . . . . . **2. S. viridula.**
Sheaths not hairy at the throat . . . . . **3. S. nelsonii.**

1. Stipa richardsonii Link. At St. Mary Lake and doubtless elsewhere at low altitudes. Alta. to Colo. and S. Dak.—Leaves involute, rough, 10 to 15 cm. long, crowded at the base of the slender, nearly naked culms; panicles 10 to 20 cm. long, the long capillary branches mostly in pairs, with bronze-purple spikelets on capillary pedicels borne toward the ends.

2. Stipa viridula Trin. Frequent at middle altitudes, in woods or on cliffs or open slopes. Mont. to Utah, Kans., and Sask.—Plants 0.6 to 1 meter tall, leafy throughout, the blades rough, more or less involute, 20 to 40 cm. long; panicle pale and shining, 15 to 30 cm. long, about 2 cm. wide, rather densely flowered; glumes 8 to 10 mm. long; body of the floret usually 5 to 6 mm. long, the awn 3 to 4 cm. long.

3. Stipa nelsonii Scribn. Reported from Blackfoot Glacier. Alta. to Utah, Colo., and Sask.—Closely related to *S. viridula*, on the average taller, with smooth, slightly broader blades, and slightly larger spikelets.

5. ORYZOPSIS Michx. Mountain rice.

1. Oryzopsis asperifolia Michx. Belton, in thin woods or on rocky slopes. B. C. to N. Mex., Pa., and N. S.—Perennial with erect sterile shoots bearing elongate flat rough blades 5 to 10 mm. wide, and nearly naked, inconspicuous, simple flowering culms 20 to 30 cm. long, nearly prostrate on the ground; panicle narrow; spikelets plump, the awn about 12 mm. long, readily falling from the body of the floret.

In habit the plants resemble species of *Carex*.

6. MUHLENBERGIA Schreb.

1. Muhlenbergia squarrosa (Trin.) Rydb. On prairie at east entrance, especially in low alkaline places about ponds. Wash. to Calif., Colo., and Mont.—Plants tufted and producing running rootstocks; culms 15 to 20 cm. tall, wiry, the blades short and spreading; spikelets about 2.5 mm. long, the lemma tipped with a minute awn.

7. PHLEUM L.

Perennials with simple erect culms, flat blades, and compact spikelike panicles.

Panicles cylindric, mostly more than 5 cm. long; culms swollen at base. **1. A. pratense.**

Panicles ovate-cylindric, rarely over 3 cm. long; culms not swollen at base. **2. A. alpinum.**

1. Phleum pratense L. Timothy. Common at low altitudes and in many places abundant, in woods and on open slopes; often found high up along the trails. Native of Eur.; cultivated and naturalized in N. Amer.—Culms 30 to 80 cm. tall; panicles commonly 8 to 10 cm. long, 5 to 7 mm. thick.

2. Phleum alpinum L. Mountain timothy. Common above timber line, in meadows; sometimes in wet places at middle altitudes. Alaska to Calif., N. Mex., N. H., and Lab.; also in Eur. and Asia.—Culms 15 to 30 cm. tall; panicles commonly 2.5 to 3 cm. long, 10 to 12 mm. thick in the middle.

The most common grass of alpine meadows.

8. ALOPECURUS L. Marsh foxtail.

Weak-stemmed perennials, growing in moist ground; culms simple; blades flat, lax; panicle very dense; spikelets falling entire.

Panicle 2 to 4 mm. thick . . . . . **1. A. aristulatus.**
Panicle 7 to 9 mm. thick . . . . . **2. A. alpinus.**

1. Alopecurus aristulatus Michx. Common at low altitudes, in boggy meadows and about ponds. Alaska to Calif., Pa., and Me.—Plants commonly in tufts; culms 15 to 25 cm. long, decumbent at the base, the nodes geniculate; panicles pale and shining; spikelets long-silky on the keel.

2. Alopecurus alpinus J. E. Smith. Common on the east slope at low altitudes, chiefly on prairie or moist open slopes. Alaska to Utah, Colo., Alta., and Lab.; also in Eur. and Asia. (*A. occidentalis* Scribn. & Tweedy.)—Plants single or few together; culms 25 to 70 cm. tall, nearly erect; panicles gray or drab; spikelets long-silky all over.

9. CINNA L.

1. Cinna latifolia (Trevir.) Griseb. REEDGRASS. Common at low and middle altitudes, in moist woods or meadows. B. C. to Utah, N. C., and Newf.; also in Eur.—Plants perennial, with simple erect culms, 1 meter or more tall, flat blades 1 to 1.5 cm. wide, and handsome drooping panicles 20 to 30 cm. long, the spikelets 3 to 4 mm. long, falling entire.

10. AGROSTIS L. BENTGRASS.

Plants perennial, with simple culms, flat blades, and open or contracted panicles of V-shaped spikelets, 2 to 4 mm. long, the glumes persistent after the fall of the florets.

Floret nearly equaling the glumes. Palea developed . . . . . **1. A. thurberiana.**
Floret noticeably shorter than the glumes.
  Plants producing running rootstocks; palea well developed . . . . **2. A. palustris.**
  Plants without rootstocks; palea obsolete.
    Panicle dense, its branches verticillate, with short branchlets spikelet-bearing to the base in their axils . . . . . **3. A. exarata.**
    Panicle loose and open, the branches naked at the base.
      Panicle very diffuse, the lower branches commonly 10 cm. or more long. **4. A. hiemalis.**
      Panicle open but not diffuse, the lower branches rarely over 5 cm. long. **4a. A. hiemalis geminata.**

1. Agrostis thurberiana Hitchc. At middle altitudes and above timber line, in moist soil. B. C. to Calif., Utah, and Mont.—Plants tufted, rather lax, the delicate culms 20 to 40 cm. tall, the soft blades mostly clustered at the base; panicles 5 to 8 cm. long, loosely flowered, the branches and branchlets flexuous, divaricate.

2. Agrostis palustris Huds. REDTOP. Common at low altitudes, in wet or moist soil, often in sphagnum bogs. Widely distributed in N. Amer., partly or wholly naturalized; often cultivated as a meadow or pasture grass; also in Eur. (*A. alba* of American authors.)—Plants relatively stout, the culms mostly 50 cm. or more tall; blades rough, 3 to 6 mm. wide; panicle pyramidal, mostly purple and 10 to 20 cm. long, the rather closely flowered branches in distant fascicles on the main axis, the branchlets spreading in flower but contracted at maturity.

3. Agrostis exarata Trin. Chiefly at low and middle altitudes, but sometimes about timber line, in meadows or moist woods or along streams. Alaska to Calif., N. Mex., and Nebr.; also in Siberia. (*A. grandis* Trin.; *A. asperifolia* Trin.)—Plants tufted, often rather stout, 30 to 75 cm. tall; blades rough, 2 to 5 mm. wide; panicle yellowish green, narrow, 10 to 20 cm. long, the short, densely flowered branches crowded in whorls, the lower distant, the upper close together; glumes long-pointed.

Plants at high altitudes are often low and delicate, with less densely flowered panicles.

4. Agrostis hiemalis (Walt.) B. S. P. TICKLE GRASS. Common nearly everywhere at low and middle altitudes, in moist woods and thickets or in meadows. Alaska to Mex., Fla., and Lab.—Plants tufted, leafy at the base, 30 to 50 cm. tall; blades mostly less than 2 mm. wide; culms slender, brittle; panicles often nearly half the entire height of the plant and about as broad as long, the few capillary branches widely spreading, spikelet-bearing toward the ends only.

At maturity the panicles break away and roll before the wind, scattering the seed.

4a. Agrostis hiemalis geminata (Trin.) Hitchc. Granite Park, on moist rocky slopes, and doubtless elsewhere. Alaska to Calif. and Colo. (*A. geminata* Trin.)—Plants mostly not over 20 cm. tall; panicles less diffuse than in the species, the lemmas often awned from the back.

11. CALAMAGROSTIS Adans. Reedgrass.

Erect perennials resembling *Agrostis*, distinguished from that genus by the tuft of silky hairs at the base of the floret, by the well-developed palea, and by the development of a rachilla joint in the form of a little bristle back of the palea; lemma always awned from below the middle of the back.

Awn about twice as long as the glumes, geniculate. Panicles contracted, densely flowered; glumes 5 to 6 mm. long.

Blades coarse, 4 to 5 mm. wide; sheaths mostly overlapping; spikelets short-pediceled . . . . . 1. C. purpurascens.

Blades 2 to 3 mm. wide, subinvolute; sheaths not overlapping; most of the spikelets on pedicels nearly as long as the glumes . . . . . 2. C. vaseyi.

Awn scarcely exceeding the glumes or included in them.

Panicle loose and nodding . . . . . 6. C. canadensis.

Panicle contracted, rather densely flowered.

Leaves densely pubescent at the junction of sheath and blade; awn geniculate, protruding sidewise from the glumes; hairs at base of floret less than half as long as the lemma . . . . . 3. C. rubescens.

Leaves glabrous at the junction of sheath and blade; awn straight, not protruding sidewise; hairs at base of floret copious, nearly as long as the lemma.

Blades rough, firm, 2 to 7 mm. wide . . . . . 4. C. inexpansa.

Blades smooth, soft, not over 3 mm. wide . . . . . 5. C. neglecta.

1. Calamagrostis purpurascens R. Br. Found at all altitudes, on shaded banks, rocky slopes, or cliffs. Alaska to Calif., Colo., S. Dak., and Greenl.—Plants in small tufts, 20 to 30 cm. tall, rather stout, the base of the culms clothed with old weather-worn leaves; panicle purplish, 5 to 10 cm. long, 1 to 1.5 cm. thick.

2. Calamagrostis vaseyi Beal. Collected on trail to Sperry Glacier by Holzinger. Wash. and Oreg. to Mont.—Plants in tufts, the knotty base with numerous leafy shoots, the culms sometimes spreading and geniculate below; panicle mostly tawny or pale, less dense than in *P. purpurascens*.

3. Calamagrostis rubescens Buckl. At low and middle altitudes, in thin woods or on open slopes or rocks. B. C. and Alta. to Wyo. and Calif.—Plants in small tufts, 50 to 90 cm. tall, with numerous long rough blades 2 to 5 mm. wide, and pale or purplish, shining panicles 10 to 15 cm. long; glumes glabrous, acuminate.

4. Calamagrostis inexpansa A. Gray. Frequent at low altitudes, in woods. B. C. and Wash. to Colo., N. J., and N. Y.—Plants single or few together, often with running rootstocks; culms 0.7 to 1 meter or more tall; blades elongate, involute toward the very rough ends; panicles mostly tawny and 12 to 20 cm. long; glumes scabrous, abruptly acute.

5. Calamagrostis neglecta (Ehrh.) Gaertn. Collected in clearings at Summit by Griffiths. Alaska to Colo., Wis., Me., and Greenl.; also in Eur.—Plants more slender than in *C. inexpansa*, and not so tall, the foliage smooth and softer, the panicles on the average smaller.

6. Calamagrostis canadensis (Michx.) Beauv. Frequent at low and middle altitudes, sometimes above timber line, in meadows or swamps. Alaska to Calif., N. Mex., N. C., and Newf.—Plants tufted and with running rootstocks, the numerous rough elongate blades 4 to 6 mm. wide; panicle 15 to 30 cm. long, about one-third as wide, the capillary branches drooping; hairs at the base of the floret copious and as long as the lemma; awn inconspicuous.

12. AIRA L. Hairgrass.

Erect perennial bunchgrasses with slender simple culms and shining few-flowered spikelets, the florets awned from the back below the middle.

Panicles long and narrow; blades filiform . . . . . **1. A. elongata.**
Panicle open, commonly nearly or quite as wide as long; blades not filiform.
  Blades firm, folded, mostly 2 to 4 mm. wide . . . . . **2. A. caespitosa.**
  Blades soft, flat, 5 to 10 mm. wide . . . . . **3. A. atropurpurea.**

1. Aira elongata Hook. At low and middle altitudes, in meadows or on open slopes. B. C. to Ariz. and Wyo. (*Deschampsia elongata* Munro.)—Plants 30 to 60 cm. tall, the loose narrow panicle being one-fourth to one-third the entire height of the plant; spikelets commonly purple-tinged; awns exceeding the glumes.

2. Aira caespitosa L. Common at low altitudes, in meadows, on stream or lake banks, or on open hillsides. Alaska to Calif., N. Mex., N. J., and Newf.; also in Eur. and Asia. (*Deschampsia caespitosa* Beauv.)—Plants 20 to 60 cm. tall, often forming dense cushions, the spreading leaves mostly crowded toward the base of the culms; panicles with spreading capillary branches in distant fascicles; spikelets from pale to purplish bronze; awns inconspicuous.

3. Aira atropurpurea Wahl. At middle and high altitudes, in woods or on open slopes. Alaska to Calif., Colo., N. H., and Greenl.; also in Eur. (*Deschampsia atropurpurea* Scheele.)—Plants 30 to 50 cm. tall, with abundant soft green foliage and drooping panicles, the purplish spikelets 5 mm. long, the bent awns about reaching the apex of the glumes.

13. TRISETUM Pers.

Erect perennials resembling *Aira*, the spikelets as in that genus, but the lemmas keeled, awned from the back above the middle (the awn obsolete in one species) and 2-toothed at the acute apex.

Panicles loose, drooping or nodding; blades elongate, lax, 8 to 15 mm. wide. Awns more than twice as long as the spikelet.
  Panicle branches capillary, drooping, 5 to 10 cm. long . . . . . **1. T. cernuum.**
  Panicle branches slender but rather stiffly ascending . . . . . **2. T. canescens.**
Panicles mostly dense (if rather loose, the awns nearly obsolete), erect; blades rarely over 5 mm. wide.
  Awns minute or obsolete . . . . . **3. T. wolfii.**
  Awns conspicuous . . . . . **4. T. spicatum.**

1. Trisetum cernuum Trin. Frequent at middle altitudes. Alaska to Calif. and Mont.—A woodland grass, often 1 meter tall, with drooping scabrous blades; panicle branches spikelet-bearing toward the ends only; spikelets about 1 cm. long, excluding the spreading awns; rachilla joints half as long as the florets.

2. Trisetum canescens Buckl. At low and middle altitudes, in damp or rocky woods. B. C. and Mont. to Calif.—A woodland grass resembling the preceding, but the leaves softly pubescent, the panicle more densely flowered, the stiffer panicle branches spikelet-bearing nearly to the base, the rachilla joints short, bringing the florets close together in the spikelet.

3. Trisetum wolfii Vasey. At low and middle altitudes, in meadows or moist woods or on open slopes. Wash. to Calif., Colo., and Mont. (*Graphephorum wolfii* Vasey.)—Plants tufted, 50 to 90 cm. tall, leafy, the panicles mostly dense but not spikelike, the awns minute or obsolete.

4. Trisetum spicatum (L.) Richt. Very common above timber line in meadows; sometimes also at middle elevations. Alaska to Calif., N. Mex., N. H., and Greenl.; also in Eur. and Asia.—Plants densely tufted, 15 to 50 cm. tall, the foliage relatively scant and crowded toward the base, commonly grayish-velvety, the panicles dense, spikelike, the awns spreading.

14. KOELERIA Pers.

1. Koeleria cristata (L.) Pers. JUNEGRASS. Common at low and middle altitudes, chiefly on open slopes. B. C. to Calif., Tex., and Ill.; also in Eur. and Asia. (*K. gracilis* Pers.)—An erect perennial bunchgrass, 25 to 40 cm. tall; leaves mostly confined to the lower half of the slender simple culms, the blades narrow, mostly flat; panicle 5 to 10 cm. long, dense, spikelike, shining.

This grass resembles species of *Poa*, even to having blades boat-shaped at the tip as in that genus. It may be distinguished by the sharp-pointed, indistinctly nerved lemmas and the shining white hyaline paleas. An important forage grass.

15. AVENA L.

1. Avena sativa L. OATS. Scattered plants in waste ground and along the railroad at Belton and east entrance. Native of the Old World; widely cultivated and often escaping.—The cultivated oat, readily recognized by its open panicle of large drooping spikelets, comes up where stock has been fed. Under cultivation the awns are much reduced, but they are usually well developed in plants growing spontaneously.

16. DANTHONIA DC.

Tufted perennials with narrow blades and rather small panicles of relatively large spikelets.

Culms bearing a single spikelet (sometimes a second partly developed one on an appressed pedicel below) . . . . . **1. D. unispicata.**
Culms bearing panicles of few to several spikelets.
  Panicle open, the branches divergent; spikelets few . . . . . **2. D. americana.**
  Panicles narrow, dense; spikelets several . . . . . **3. D. intermedia.**

1. Danthonia unispicata Munro. At low and middle altitudes on the east slope, on open hillsides. B. C. to Calif. and Wis.—Plants in dense tufts, mostly less than 20 cm. tall, the culms somewhat spreading; sheaths conspicuously pilose; spikelet 12 to 15 mm. long.

2. Danthonia americana Scribn. Meadows at the east entrance, *Umbach*. B. C. to Calif. and Wyo.; also in Chile.—Plants in dense tufts or cushions, 25 to 70 cm. tall; sheaths pilose; panicles of 2 to 5 mostly purple spikelets on divergent pedicels.

3. Danthonia intermedia Vasey. Found at nearly all altitudes, on plains or open slopes. B. C. to Calif., N. Mex., and Que.—Plants tufted, 30 to 70 cm. tall; sheaths glabrous; spikelets 5 to 10 or more on erect pedicels and crowded in a narrow, purple or pale, glistening panicle.

17. BECKMANNIA Host.

1. Beckmannia erucaeformis (L.) Host. SLOUGH GRASS. Common at low altitudes, along streams or in swampy ground. Alaska to Calif., N. Mex., and Ont.; also in Eur. and Asia.—An erect, rather stout, glabrous annual, with flat blades and numerous short erect spikes on an elongate axis; spikelets flattened, somewhat heart-shaped in outline, overlapping.

18. CATABROSA Beauv.

1. Catabrosa aquatica (L.) Beauv. East entrance, about pools. Alaska to Colo., Que., and Lab.; also in Eur. and Asia.—A semiaquatic perennial, 20 to 30 cm. tall, with creeping base, soft flat blades, and open panicles of brown spikelets tipped with white.

19. MELICA L.

Rather tall perennials with simple culms, narrow flat blades, and open or narrow panicles; spikelets relatively large, the glumes thin, the lemmas firm, with strong nerves.

Lemmas awned from a 2-toothed apex; panicle branches long and divergent; culms not thickened at base . . . . . **4. M. smithii.**
Lemmas awnless; panicle branches ascending; culms with a cormlike base.
  Spikelets narrow; lemmas acuminate . . . . . **3. M. subulata.**
  Spikelets broad; lemmas obtuse or abruptly acute.
    Pedicels capillary, flexuous . . . . . **1. M. spectabilis.**
    Pedicels stouter, appressed . . . . . **2. M. bella.**

1. Melica spectabilis Scribn. ONION GRASS. At middle altitudes, in meadows or thin woods. B. C. to Oreg., Colo., and Mont.—Culms tall and slender, from an onion-shaped base; panicle nodding, the beautiful bronze-purple spikelets about 12 mm. long.

2. Melica bella Piper. West slope, in meadows at middle altitudes. Wash. and Oreg. to Colo. and Alta.—Plants resembling the preceding, but not so tall, the culm bases less thickened, the panicles stiffer, and the spikelets somewhat smaller.

3. Melica subulata (Griseb.) Scribn. At low altitudes, in thin woods or on open slopes. Alaska to Calif. and Mont.—Culms commonly 1 meter tall, the base a little thickened; panicles elongate, the stiff branches ascending, the pale spikelets on short erect pedicels.

4. Melica smithii (Porter) Vasey. At low and middle altitudes, in woods. Wash. and Oreg. to Wyo. and Mich.—A tall slender woodland grass with lax blades and few-flowered, very open, nodding panicles.

20. DISTICHLIS Raf.

1. Distichlis spicata (L.) Greene. SALTGRASS. East entrance, frequent in alkali spots about dried-up pools on prairie. Widely distributed in N. Amer.—A low, rather pale, sod-forming perennial, with numerous stiff spreading blades and narrow compact panicles of smooth spikelets, the pistillate shorter and broader than the staminate.

21. POA L. BLUEGRASS.

Slender grasses with simple, mostly erect culms, narrow blades with boat-shaped tips, and open or compact panicles of relatively small spikelets.

Plants annual, low . . . . . **1. P. annua.**
Plants perennial.
  Plants producing rootstocks and forming a sod.
    Culms conspicuously flattened, wiry; panicle rather narrow and compact. **2. P. compressa.**
    Culms terete or nearly so; panicle open.
      Spikelets mostly less than 6 mm. long; lemmas pubescent on the nerves and with a cottony tuft at base . . . . . **3. P. pratensis.**
      Spikelets mostly 8 to 10 mm. long; lemmas glabrous on the nerves and not cottony at base . . . . . **4. P. wheeleri.**
  Plants not producing rootstocks; bunchgrasses.
    Lemmas pubescent on the nerves and sometimes cottony at base.
      Lemmas cottony at base (with a few long fine crinkly hairs) distinct from the pubescence of the nerves.

Plants slender and lax, growing in mossy bogs, the culms simple or few in a tuft; sheaths slightly retrose-scabrous; panicle open, the few branches slender and drooping, bearing spikelets toward the ends.
5. P. leptocoma.

Plants erect and firm, sometimes decumbent at base; sheaths glabrous; panicle erect or nodding, much branched.

Culms erect at base, the sheaths terete; panicles usually averaging less than 10 cm. long . . . . . **6. P. crocata.**

Culms decumbent at base, the lower sheaths compressed-keeled; panicle often 30 cm. long, usually over 10 cm. long . . . . . **7. P. palustris.**

Lemmas not cottony at base, though the pubescence on the nerves may be more dense toward the base . . . . . **8. P. alpina.**

Lemmas not pubescent on the nerves, sometimes pubescent all over the lower part of the back.

Lemmas glabrous; panicle narrow and compact, almost spikelike.
9. P. epilis.

Lemmas pubescent on the lower part, convex on the back; panicle rather open.

Culms spreading and loosely decumbent at base . . . . . **10. P. gracillima.**

Culms erect at base.

Leaves mostly basal, a reduced blade about the middle of the slender naked culm; blades folded . . . . . **11. P. sandbergii.**

Leaves scattered along the tall culm; blades flat . . . . . **12. P. lucida.**

1. Poa annua L. ANNUAL BLUEGRASS. Open places along McDonald Creek. Widely distributed in N. Amer., Eur., and Asia.—Plants in tufts or mats, with glossy green foliage and small pale open panicles.

Blooming earlier than any other grass in the region.

2. Poa compressa L. CANADA BLUEGRASS. About Belton and the east entrance, in waste ground; adventive. Widely naturalized in N. Amer.; native of Eur. and Asia.—Plants bluish green, with flat culms and rather scant foliage; spikelets green, with bronze tips.

3. Poa pratensis L. KENTUCKY BLUEGRASS. Frequent at low and middle altitudes, in meadows or thin woods; planted for lawns at Belton and elsewhere. Widely distributed in N. Amer., Eur., and Asia; in N. Amer., at least in part, naturalized from Eur.—Plants leafy, the culms 30 to 70 mm. tall; panicles pyramidal, nearly as broad as long, the lower branches mostly in fives.

4. Poa wheeleri Vasey. Belton, in open woods. B. C. to Colo. and Alta.—Plants resembling the preceding, on the average taller and coarser, with larger panicle, its lower branches mostly in twos.

5. Poa leptocoma Trin. Above or near timber line, in meadows or woods or on open slopes. Alaska to Wash. and Colo.—Plants in loose tufts, with weak culms, soft blades, and few-flowered, very open panicles.

6. Poa crocata Michx. Common at low and middle altitudes, in woods or meadows. Alaska to Ariz., Mont., and Lab.—Plants in dense tufts, the rather wiry culms 40 to 75 cm. tall, the rather small purplish spikelets on short divergent pedicels, giving the panicle a delicate lacy aspect.

7. Poa palustris L. East entrance, in aspen thicket. Widely distributed in N. Amer., Eur., and Asia. (*P. triflora* Gilib.)—Culms commonly 70 to 100 cm. tall, often decumbent at base; blades somewhat scabrous; panicles nodding, with slender branches in distant fascicles, the small spikelets commonly bronze or golden.

8. Poa alpina L. Common, chiefly above timber line, but sometimes at low or middle altitudes, in woods or meadows or along streams. Alaska to Colo., Que., and Greenl.; also in Eur. and Asia.—Plants densely tufted, commonly with a

cushion of soft foliage at base, the short blades spreading; panicles rather densely flowered, the broad spikelets commonly purple or bronze.

9. Poa epilis Scribn. Frequent above timber line, in meadows. B. C. to Colo. and Mont.—Plants pale, in dense leafy tufts, the blades narrow, flexuous, folded, rough; panicles dense, pale, and shining.

10. Poa gracillima Vasey. Frequent above or near timber line, in meadows or on rocky slopes. B. C. to Calif. and Mont.—Plants in loose bunches with a mass of spreading foliage at the base, the culms commonly 25 to 40 cm. tall, the pale purple-tinged spikelets 6 to 10 mm. long.

11. Poa sandbergii Vasey. At high and middle altitudes, in meadows or on rocky slopes. B. C. to Calif., Colo., and Mont.—Plants in small dense tufts, often purplish at base, the leaves crowded at the base, the short blades commonly curled, the flexuous panicles mostly 5 to 8 cm. long, the spikelets ashy-purple.

12. Poa lucida Vasey. Belton, in open gravelly soil. Alta. to N. Mex. and S. Dak.—Plants in dense tufts, with slightly scabrous blades and narrow pale shining panicles, the short erect branches spikelet-bearing from near the base.

22. PANICULARIA Fabr.

Tall marsh grasses with flat blades and open panicles, the spikelets with short thin glumes and strongly nerved, obtuse lemmas.

Spikelets linear, 12 mm. or more long, pale . . . . . **1. P. borealis.**
Spikelets oval, not over 6 mm. long, dark green or purple.
  Lemmas with 5 prominent nerves, the summit white and delicate. **2. P. pauciflora.**
  Lemmas with 7 prominent nerves, only the very tip delicate.
    Blades mostly 3 to 7 mm. wide . . . . . **3. P. nervata.**
    Blades 8 to 10 mm. wide . . . . . **4. P. nervata elata.**

1. Panicularia borealis Nash. Bog at Johns Lake, *Vreeland.* Alaska to Calif., N. Mex., N. Y., and Me. (*Glyceria borealis* Batchelder.)—Culms commonly 1 meter tall, rather thick and lush; blades ascending, 5 to 8 mm. wide; panicle 20 to 40 cm. long, the rather few slender branches stiffly ascending or spreading, the spikelets short-pediceled toward their ends.

2. Panicularia pauciflora (Presl) Kuntze. At low altitudes, in swamps or along streams. B. C. to Calif., Colo., and Mont. (*Glyceria pauciflora* Presl.)—Plants rather stout, 40 to 80 cm. tall, with creeping rootstocks, rough spreading blades 8 to 12 mm. wide, and nodding many-flowered panicles with flexuous branches; spikelets 4 to 6 mm. long, the white summits of the lemmas contrasting with the green or purple body.

3. Panicularia nervata (Willd.) Kuntze. At low altitudes, in wet soil. Alaska to Mex., Fla., and Lab. (*Glyceria nervata* Trin.)—Culms 60 to 100 cm. tall, often in large clumps; blades spreading; panicles drooping; spikelets 3 to 4 mm. long.

4. Panicularia nervata elata (Nash) Piper. At low and middle altitudes, in wet soil. B. C. to Calif. and Mont. (*Glyceria elata* Hitchc.)—Plants on the average taller than in the preceding, with broader laxer blades and larger panicle, the spikelets 4 to 5 mm. long.

23. PUCCINELLIA Parl.

1. Puccinellia nuttalliana (Schult.) Hitchc. East entrance, in low alkali spots on prairie. B. C. to Calif., N. Mex., and N. Dak.—A tufted slender perennial with narrow blades and a relatively large, erect panicle with slender stiff flexuous spreading branches naked at the base; spikelets grayish purple, 4 to 7 mm. long.

24. **FESTUCA** L. Fescue.

Perennials (in this region), commonly tufted, with narrow blades and open or contracted panicles.

Plants with stout rootstocks. Lemmas awnless . . . . . **1. F. confinis.**
Plants tufted, without rootstocks (dark red rootstocks sometimes developed in no. 3).
  Blades flat, broad, and thin . . . . . **2. F. subulata.**
  Blades narrow or involute, usually rather stiff.
    Blades smooth.
      Culms slender and decumbent at the reddish base; blades not filiform. **3. F. rubra.**
      Culms not decumbent and red at base; blades filiform.
        Plants 50 cm. or more tall . . . . . **4. F. occidentalis.**
        Plants mostly less than 20 cm. tall . . . . . **5. F. brachyphylla.**
    Blades very rough.
      Lemmas awnless, 6 to 7 mm. long; blades not filiform . . . . **6. F. scabrella.**
      Lemmas awned; blades filiform.
        Plants usually 40 cm. or more tall; blades 15 to 25 cm. long. **7. F. idahoensis.**
        Plants usually less than 30 cm. tall; blades 5 to 10 cm. long. **8. F. saximontana.**

1. Festuca confinis Vasey. Hills at east entrance, *Umbach.* Oreg. and Calif. to Colo. and Mont.—Plants in large clumps, 50 to 80 cm. tall, relatively stout, with firm flat blades and narrow, rather compact, pale panicles; glumes thin and shining; lemmas very scabrous.

2. Festuca subulata Bong. At low and middle altitudes, in moist woods. Alaska to Calif., Colo., and Mont.—A slender lax woodland grass, with soft blades and open drooping panicle; spikelets about 1 cm. long, excluding the slender awns, these as long as the body of the lemma.

3. Festuca rubra L. Granite Park, on open moist rocky slope, and doubtless elsewhere. Alaska to Colo., Va., and Greenl.; also in Eur. and Asia.—Plants in loose clumps, the basal sheaths commonly shredded; culms usually 40 to 50 cm. tall; panicles somewhat nodding, the slender branches spreading, rather compactly flowered toward the ends; spikelets dull or grayish purple, short-awned.

4. Festuca occidentalis Hook. Frequent at low and middle altitudes, in thin woods or on open slopes. B. C. to Calif., Wyo., and Mont.—Culms 50 to 75 cm. tall, with a dense tuft of laxly spreading filiform blades at base; panicles open, nodding, the long-awned spikelets borne toward the ends of the few slender branches.

5. Festuca brachyphylla Schult. Above timber line, in meadows or on rocky slopes. Alaska to Calif., N. Mex., Vt., and Greenl.—Plants in dense tufts or cushions, the leaves crowded at the base; panicles narrow, mostly rather compact, the spikelets short-awned.

6. Festuca scabrella Torr. Grassy slopes, at middle altitudes. B. C. and Wash. to Colo. and Mont.—Plants densely tufted, pale, the blades elongate, rather wiry; panicles nodding, the branches ascending.

7. Festuca idahoensis Elmer. Frequent at low and middle altitudes, on prairie or open slopes. Idaho and Mont.—Culms few together, from a dense tuft of rough, laxly spreading, filiform blades; panicles loose, nodding; spikelets short-awned.

Resembles no. 4, but readily distinguished by the very rough blades.

8. Festuca saximontana Rydb. Rocky slopes about Lake McDermott. B. C. to Colo. and Mich.—In dense tufts or cushions; like the preceding, but culms and blades usually less than half as tall; panicles narrow, the spikelets smaller.

25. BROMUS L. Brome grass.

Erect annuals or perennials, with flat blades and several to many-flowered, relatively large spikelets, borne in open or narrow panicles.

Plants annual, introduced weeds.
  Culms in low tufts; spikelets long-awned.
    Spikelets villous . . . . . **1. B. tectorum.**
    Spikelets glabrous or nearly so . . . . . **1a. B. tectorum nudus.**
  Culms 50 cm. or more tall; spikelets short-awned . . . . . **2. B. secalinus.**
Plants perennial, native except no. 5.
  Spikelets strongly flattened, the glumes compressed-keeled.
    Lemmas glabrous or scabrous only . . . . . **3. B. polyanthus.**
    Lemmas pubescent . . . . . **4. B. marginatus.**
  Spikelets not flattened, the glumes convex.
    Plants with creeping rootstocks.
      Lemmas glabrous, mostly awnless . . . . . **5. B. inermis.**
      Lemmas pubescent on the margin, short-awned . . . . . **6. B. pumpellianus.**
    Plants without rootstocks.
      Ligule prominent, 3 to 5 mm. long . . . . . **7. B. vulgaris.**
      Ligule obscure, about 1 mm. long . . . . . **8. B. richardsonii.**

1. Bromus tectorum L. Belton, in waste ground. Native of Eur.; widely naturalized in N. Amer.—Plants often in extensive colonies, softly pubescent, with conspicuously drooping panicles of narrowly V-shaped, long-awned spikelets.

Young plants rather handsome but becoming unsightly in age; the awned florets injurious to grazing animals.

1a. Bromus tectorum nudus Klett & Richt. East entrance, on open slopes. Native of Eur.; naturalized in N. Amer.—Plants less pubescent than in the species, the spikelets glabrous or nearly so.

This and the typical form are very common in the park at low altitudes, in cultivated or waste ground and on open slopes.

2. Bromus secalinus L. Chess or cheat. Belton, in gravelly open ground. Native of Eur.; widely naturalized in N. Amer., especially in grain fields.—Plants glabrous; panicles nodding, with rather heavy plump glabrous spikelets.

3. Bromus polyanthus Scribn. At middle altitudes, in woods. Oreg. to N. Mex. and Mont.—Plants tufted, leafy, commonly 1 meter or more tall, with flat lax blades and narrow, rather stiff panicles; lemmas with shining yellowish margins and short awns.

4. Bromus marginatus Nees. Common at low and middle altitudes, in woods or on open slopes. B. C. to Calif., Ariz., and Alta.—Plants in small tufts, 60 to 100 cm. tall, with elongate blades, 5 to 12 mm. wide, and rather stiff panicles, the purplish short-awned spikelets 2.5 to 4.5 cm. long.

5. Bromus inermis Leyss. East entrance, on dry bank. Native of Eur.; adventive in N. Amer.—Culms commonly 1 meter or more tall, with glabrous leaves and many-flowered panicles, the numerous branches whorled and ascending, the spikelets loosely flowered, rather soft, oblong, 2 to 3 cm. long.

6. Bromus pumpellianus Scribn. At low and middle altitudes, sometimes about timber line, on prairie or open slopes. Alaska to Colo. and S. Dak.—Culms 50 to 100 cm. tall, the leaves more or less pubescent; panicle narrow, the fascicled branches often spikelet-bearing nearly to the base; spikelets 2 to 3 cm. long.

7. Bromus vulgaris (Hook.) Shear. At low and middle altitudes, in woods or on open slopes. B. C. to Calif. and Mont.—A slender, yellowish green, woodland grass with softly pubescent leaves and nodding panicles, the spikelets pubescent and with slender awns.

8. Bromus richardsonii Link. Common at low and middle altitudes, in woods or meadows. B. C. to N. Mex. and Sask.—Plants rather robust, 1 meter or more tall; blades elongate, glabrous or nearly so; panicles drooping, the slender flexuous branches fascicled; spikelets 2 to 3 cm. long, on flexuous pedicels.

26. AGROPYRON Gaertn. Wheatgrass.

Erect perennials with simple culms and slender, mostly erect spikes.

Plants with creeping rootstocks, forming a tough sod.
- Lemmas pubescent . . . . . **1. A. dasystachyum.**
- Lemmas glabrous . . . . . **2. A. smithii.**

Plants without rootstocks; bunchgrasses.
- Blades, or most of them, involute.
  - Lemmas awned . . . . . **3. A. spicatum.**
  - Lemmas awnless . . . . . **4. A. inerme.**
- Blades flat or involute-pointed only.
  - Spikelets awned . . . . . **5. A. caninum.**
  - Spikelets awnless.
    - Spikes slender, the spikelets rather distant, green . . . . . **6. A. tenerum.**
    - Spikes relatively short and thick, the spikelets closely overlapping, usually violet-tinged . . . . . **7. A. violaceum.**

1. Agropyron dasystachyum (Hook.) Scribn. Collected at Summit by Griffiths. Idaho to Sask. and Wis.—Culms 50 to 100 cm. tall, with narrow, commonly somewhat involute blades, and grayish spikes 8 to 15 cm. long; lemmas awnless.

2. Agropyron smithii Rydb. Colorado bluestem. Frequent on the east slope at low or middle altitudes, on prairie or open hillsides. B. C. to Ariz., Tex., and Mo.—Culms 40 to 100 cm. tall, rather wiry; blades firm, more or less involute; spikes 10 to 15 cm. long, the spikelets overlapping, the lemmas firm, sharp-pointed.

3. Agropyron spicatum (Pursh) Scribn. & Smith. Frequent at low and middle altitudes, on open slopes or prairie. Yukon to Calif., N. Mex., and Mich.—Culms in dense tufts, slender, wiry; blades usually elongate; spike slender, the axis sometimes flexuous; lemmas with a divergent awn 1.5 to 3 cm. long.

4. Agropyron inerme (Scribn. & Smith) Rydb. Granite Park, on open rocky slopes. B. C. to Utah and Wyo.—Plants resembling the preceding, but the lemmas blunt or with an occasional one awned.

5. Agropyron caninum (L.) Beauv. Frequent at nearly all altitudes, on prairie or open slopes or in woods. Calif. to N. Mex., Mich., and N. S.; also in Eur.—Culms 60 to 100 cm. tall, often rather robust; blades 3 to 8 mm. wide; spike sometimes elongate, usually dense, often somewhat 1-sided because of the twisting of the axis; awns slender, 10 to 25 cm. long.

6. Agropyron tenerum Vasey. At low and middle altitudes, on open slopes or in woods. B. C. to Calif., N. Mex., and Minn.—Plants commonly in large clumps, 60 to 100 cm. tall; blades 3 to 6 mm. wide; spike slender, mostly 15 to 20 cm. long, often nodding at the summit.

7. Agropyron violaceum (Hornem.) Lange. Frequent, chiefly above timber line, but also in exposed places at middle altitudes. Alaska to N. Mex., Nebr., N. Y., and Greenl.—Culms mostly less than 60 cm. tall, often geniculate at base; blades relatively thin; spike mostly short and thick, with crowded, rather soft spikelets.

27. TRITICUM L.

1. Triticum aestivum L. Wheat. East entrance, along the railroad, both the bearded and beardless forms collected. Native of the Old World; cultivated and sometimes escaping.—An erect annual, forming stools, 50 to 100 cm. tall, with flat blades and thick stiff spikes, the broad plump spikelets awned or awnless.

28. HORDEUM L. Barley grass.

Perennial bunchgrasses (in this region) with flat blades and dense bristly spikes, the axis readily disjointing.

Awns 4 to 6 cm. long . . . . . **1. H. jubatum.**
Awns about 1 cm. long or less . . . . . **2. H. nodosum.**

1. Hordeum jubatum L. Squirreltail. Common at low and middle altitudes, in meadows or prairie. Alaska to Calif., Tex., N. J., and Lab.—Culms erect or spreading, 30 to 50 cm. tall, with pale nodding spikes 5 to 10 cm. long, the slender awns widely spreading.

2. Hordeum nodosum L. East entrance, on wet prairie. Alaska to Calif. and Tex.; also in Eur.—Culms often geniculate at base, 30 to 60 cm. tall, with slender spikes 3 to 10 cm. long and scarcely 1 cm. wide.

29. ELYMUS L. Wild rye.

Tall, erect, rather coarse perennials with flat blades and bristly spikes, the axis not disjointing.

Spikelets awnless. Glumes subulate.
Plants with long creeping rootstocks; spike relatively loose, some of the joints with a single spikelet . . . . . **1. E. triticoides.**
Plants without rootstocks or with very short ones; spike dense, with 2 to 4 spikelets at a joint . . . . . **2. E. condensatus**
Spikelets awned.
Awns erect or nearly so . . . . . **3. E. glaucus;**
Awns strongly divergent . . . . . **4. E. canadensis.**

1. Elymus triticoides Buckl. Reported by Jones from Blackfoot Glacier. Wash. to Calif., N. Mex., and Alta.—Culms rather wiry; blades involute toward the apex spike mostly 8 to 15 cm. long; lemmas commonly brownish, very smooth.

2. Elymus condensatus Presl. East entrance, on prairie and open slopes. B. C. to Calif., N. Mex., and Nebr.—Plants in large clumps, robust; blades elongate, 5 to 12 mm. wide; spikes 12 to 20 cm. long, 15 to 20 mm. thick; lemmas pale, more or less scabrous.

3. Elymus glaucus Buckl. At low and middle altitudes, on open slopes, in woods, or along streams. B. C. to Calif., N. Mex., and Mich.—Culms often geniculate at base; blades lax, spreading; spike erect or nearly so, the slender awns 1 to 2 cm. long.

4. Elymus canadensis L. Belton, in low flat-woods, scarce. B. C. to N. Mex., Ga., and N. S.—Culms in large clumps; blades rather thick; spikes drooping, often grayish, the flexuous divergent awns 2 to 4 cm. long.

14. CYPERACEAE. Sedge Family.

Grasslike perennials with usually solid stems; leaves 3-ranked, narrow (sometimes reduced to a sheath), the sheaths close; flowers small, in spikelets; perianth of bristles or sacklike; fruit an achene.—The species of this family are difficult to distinguish, but in Glacier Park they are not numerous, except in the genus *Carex*.

Achene inclosed in a sacklike perianth (perigynium) . . . . . **5. CAREX.**
Achenes not inclosed, the perianth consisting of bristles.
Bristles of the perianth very long (much longer than the scales) and silky, white or brown . . . . . **1. ERIOPHORUM.**
Bristles very short and inconspicuous.
Stem with only one spikelet, not leafy . . . . . **2. ELEOCHARIS.**
Stem with few or many spikelets, often leafy.
Stems hollow; spikelets flat, linear, the scales 2-ranked . . . **3. DULICHIUM.**
Stems solid; spikelets not flattened, broad, the scales spirally arranged. **4. SCIRPUS.**

1. ERIOPHORUM L. Cottongrass.

Glabrous perennials; leaves linear, the stem leaves often reduced to sheaths; spikelets 1 or few, the scales spirally arranged; perianth of 6 scales, but these divided into numerous long, soft, white or brownish bristles; achenes narrow, 3-angled.

Spikelet one on each stem . . . . . **1. E. chamissonis.**
Spikelets several . . . . . **2. E. angustifolium.**

1. Eriophorum chamissonis Mey. Bog below Lake McDermott; sphagnum bogs on the west slope. Alaska to Oreg., Wyo., and N. B.; also in Eur. and Asia.—Stems 20 to 60 cm. high, slender; bristles usually brownish, about 2 cm. long.

The silky heads are very handsome and conspicuous.

2. Eriophorum angustifolium Roth. Wet meadow below Grinnell Glacier. Alaska to Oreg., N. Mex., Ill., and Newf.—Plants slender, 30 to 60 cm. high; leaves 3 to 6 mm. wide; bracts often blackish; bristles white or brownish.

2. ELEOCHARIS R. Br. Spikerush.

Glabrous perennials; leaves represented only by sheaths; spikelet 1, erect, the scales spirally arranged; perianth of few bristles; achene 3-angled or lenticular, the base of the style persistent as a tubercle.

Achene whitish, with longitudinal ribs . . . . . **1. E. acicularis.**
Achene yellow or brownish, not ribbed.
  Style branches 2; stems 1.5 to 2 mm. thick . . . . . **2. E. palustris.**
  Style branches 3; stems about 0.5 mm. thick . . . . . **3. E. tenuis.**

1. Eleocharis acicularis (L.) Roem. & Schult. Low open ground, east entrance. Widely distributed in N. Amer., Eur., and Asia.—Stems very slender, 2 to 15 cm. high; spikelets 3 to 6 mm. long, the scales brownish.

The plants often form dense mats.

2. Eleocharis palustris (L.) Roem. & Schult. Occasional at low or rarely at middle altitudes, in wet soil. Widely distributed in N. Amer., Eur., and Asia.—Plants rather stout, 15 to 60 cm. high, green or somewhat glaucous; spikelets 6 to 20 mm. long, the scales purplish brown; achene yellowish, with a large tubercle.

3. Eleocharis tenuis (Willd.) Schult. Wet meadow below Grinnell Glacier. Sask. to Colo., Fla., and N. S.—Stems 5 to 30 cm. high, green; spikelets 3 to 10 mm. long; achenes yellowish brown, roughened, with a small tubercle.

3. DULICHIUM L. Rich.

1. Dulichium arundinaceum (L.) Britton. Sphagnum bogs on the west slope. B. C. to Tex., Fla., and Newf.; also in Centr. Amer.—Perennial, 30 to 60 cm. high, with rootstocks and slender hollow leafy stems; leaves linear, 2 to 8 cm. long, spreading; spikelets 12 to 20 mm. long, in axillary spikes.

4. SCIRPUS L.

Glabrous perennials; leaves linear, often reduced to sheaths; spikelets few or many, clustered, ovoid, the scales spirally arranged; perianth of few bristles.

Stems 3-angled, leafy; spikelets very numerous, in large umbels . **1. S. microcarpus.**
Stems round, not leafy; spikelets few, in a loose cluster, this appearing to rise from the side of the stem near the top . . . . . **2. S. occidentalis.**

1. Scirpus microcarpus Presl. Banks at Johns Lake; low places about east entrance. Alaska to Calif., N. Mex., Conn., and Newf.—Plants 0.5 to 1 meter high; leaves long, rough-edged; spikelets greenish, 3 to 4 mm. long, in dense clusters, these arranged in umbels; achenes whitish.

2. Scirpus occidentalis (S. Wats.) Chase. Bulrush. About ponds on prairie at east entrance. B. C. to Calif., N. Mex., Mo., N. Y., and Newf.—Stems about a meter high, dark green, soft and spongy; leaves all reduced to sheaths at the base of the stem; spikelets 6 to 15 mm. long, brown.

5. CAREX L. SEDGE.

(Contributed by Mr. Kenneth K. Mackenzie.)

Perennials; culms mostly triangular; leaves 3-ranked; plants monoecious or sometimes dioecious; flowers solitary in the axils of glumes; spikes pistillate or staminate, or partly both with the pistillate flowers either at the top or bottom of the spikes; perianth none; staminate flowers of 3 (rarely 2) stamens, the filaments filiform; pistillate flowers of a single pistil, with a style and 2 or 3 stigmas; achenes triangular or lenticular, completely surrounded by the perigynium.

I. Spike solitary.

Stigmas 2; achenes lenticular.
  Plants very densely cespitose; spikes staminate at top; perigynia appressed. **1. C. hepburnii.**
  Plants with slender elongate rootstocks; spikes usually pistillate or staminate; perigynia widely spreading at maturity . . . . . **4. C. gynocrates.**

Stigmas 3; achenes triangular.
  Perigynia widely spreading or reflexed at maturity, conspicuously stipitate; pistillate scales deciduous.
    Plants densely cespitose; leaf blades involute, 1 mm. wide; staminate flowers few; perigynia erect until full maturity . . . . . **2. C. pyrenaica.**
    Plants short-stoloniferous; leaf blades flat, 1.5 mm. wide or more; staminate flowers conspicuous; perigynia early deflexed . . . . . **3. C. nigricans.**
  Perigynia appressed or ascending, little if at all stipitate; pistillate scales persistent.
    Spikes staminate at top.
      Perigynia short-beaked; leaf blades acicular.
        Perigynia glabrous, the upper half empty . . . . . **1. C. hepburnii.**
        Perigynia puberulent, nearly filled by the achene . . . . . **29. C. filifolia.**
      Perigynia beakless or very nearly so; leaf blades not acicular.
        Perigynia rounded at apex, many-nerved; scales not chartaceous. **27. C. leptalea.**
        Perigynia not rounded at apex, 2-ribbed, otherwise nerveless; scales chartaceous . . . . . **28. C. geyeri.**
    Spikes entirely staminate or entirely pistillate, the culms dioecious.
      Perigynia strongly pubescent . . . . . **30. C. scirpoidea.**
      Perigynia glabrous . . . . . **36. C. parryana.**

II. Spikes more than one.

A. Stigmas 2; achenes lenticular.

B. Lateral spikes short, sessile, the terminal spike pistillate at top or bottom, or throughout.

C. Perigynia not white-puncticulate.

Plants with long-creeping rootstocks, the culms arising one or few together; spikes staminate at top or throughout.
  Sheaths white-hyaline opposite the blades.
    Rootstocks slender, light brownish; culms obtusely triangular, normally smooth; heads dioecious or nearly so; perigynia strongly nerved ventrally. **5. C. douglasii.**
    Rootstocks stout, blackish; culms sharply triangular, normally rough above; heads not dioecious; perigynia nerveless or nearly so ventrally. **6. C. praegracilis.**
  Sheaths green-striate opposite the blades nearly to the mouth. Heads not dioecious; perigynia strongly striate ventrally . . . . . **7. C. sartwellii.**

Plants cespitose, the rootstocks short; spikes staminate at top or bottom.
Spikes staminate at top.
Spikes not very numerous, capitate; perigynia 4 to 5 mm. long, plano-convex, green, at least on margin . . . . . **8. C. hoodii.**
Spikes very numerous, in a compound head; perigynia 2 to 2.75 mm. long, unequally biconvex, brown, shining . . . . . **9. C. diandra.**
Spikes (at least the terminal one) staminate at bottom.
Perigynia at most sharp-margined.
Perigynia spreading at maturity.
Perigynia broadest in middle, the beak sparingly serrulate; culms weak. **10. C. laeviculmis,**
Perigynia broadest near base, the beak strongly serrulate; culms stiff. **11. C. interior.**
Perigynia appressed . . . . . **12. C. leptopoda.**
Perigynia narrowly to strongly wing-margined, the beak serrulate.
Bracts conspicuous, exceeding the head . . . . . **13. C. athrostachya.**
Bracts not conspicuous, shorter than the head.
Scales about the length of the perigynia and of the same width above and concealing them.
Perigynia with beak not hyaline at tip, flattened and serrulate nearly to tip. **14. C. aenea.**
Perigynia with beak hyaline at tip, the tip terete and little if at all serrulate.
Culms and head stiff and rigid; culms 10 to 30 cm. high, in large stools. **16. C. phaeocephala.**
Culms in clumps, slender; head flexuous or moniliform.
Scales tinged with light reddish brown . . . . . **17. C. praticola.**
Scales tinged with chestnut brown . . . . . **18. C. piperi.**
Scales shorter than perigynia and narrower above, the upper part of the perigynia conspicuous in the spikes.
Perigynia with beak flat and serrulate to tip . . . . . **15. C. bebbii.**
Perigynia with tip of beak terete and little if at all serrulate.
Perigynia thin and flattened, except where distended by achene.
Perigynia 3.5 to 5 mm. long, appressed; culms tall, 20 to 70 cm. high. **19. C. festivella.**
Perigynia 4.5 to 6 mm. long, the beaks conspicuously spreading; culms low, 10 to 40 cm. high . . . . . **20. C. nubicola.**
Perigynia strongly plano-convex, thick.
Spikes densely capitate; perigynia with beak obliquely cut, dark-tipped . . . . . **21. C. pachystachya.**
Spikes not capitate; perigynia with beak bidentate, reddish-tipped. **22. C. preslii.**

CC. Perigynia white-puncticulate.

Spikes staminate at top; perigynia 1 to 5 to a spike, unequally biconvex. **23. C. disperma.**
Spikes staminate at bottom; perigynia more numerous, plano-convex.
Perigynia broadest near middle; beak short, smooth or moderately serrulate.
Spikes closely approximate; scales strongly tinged with reddish brown; perigynia with beak smooth or essentially so . . . . . **24. C. lachenalii.**
Spikes not closely approximate, the lower spikes separated; scales little if at all tinged with reddish brown; perigynia with beak usually more or less serrulate . . . . . **25. C. canescens.**
Perigynia ovate, broadest near the base; beak conspicuous, strongly serrulate. **26. C. arcta.**

BB. Lateral spikes elongate, more or less peduncled; terminal spike or spikes normally staminate.

Culms 3 to 40 cm. high; pistillate spikes 4 to 20-flowered; perigynia golden-yellow and translucent at maturity . . . . . **32. C. aurea.**

Culms 20 to 140 cm. high; pistillate spikes many-flowered; perigynia not golden-yellow and not translucent at maturity.

Perigynia green or straw-colored, dull; style jointed with achene.

Perigynia with beak not bidentate.

Perigynia conspicuously nerved; leaf blades 1 to 3 mm. wide; stolons absent. **45. C. kelloggii.**

Perigynia nerveless ventrally or nearly so; leaf blades 4 to 8 mm. wide; long horizontal stolons present . . . . . **46. C. substricta.**

Perigynia with beak markedly bidentate and with body strongly ribbed. **47. C. nebraskensis.**

Perigynia tinged with yellowish brown, shining; style continuous with achene. **52. C. miliaris.**

AA. Stigmas 3; achenes triangular.

Perigynia hairy.

Culms 5 to 25 cm. high; pistillate spikes few-flowered; perigynia 2-ribbed, otherwise nerveless . . . . . **31. C. rossii.**

Culms 60 to 90 cm. high; pistillate spikes many-flowered; perigynia many-nerved.

Leaf blades flat, more than 2 mm. wide . . . . . **48. C. lanuginosa.**

Leaf blades involute, 2 mm. wide or less . . . . . **49. C. lasiocarpa.**

Perigynia not hairy.

Bract of lowest pistillate spike sheathing.

Pistillate spikes drooping, on capillary peduncles, 2 to 12-flowered; perigynia not bidentate . . . . . **33. C. capillaris.**

Pistillate spikes erect, many-flowered; perigynia bidentate.

Perigynia 2 to 3 mm. long, the beak scarcely half as long as the body. **50. C. viridula.**

Perigynia 4 to 6 mm. long, the beak about as long as the body . . . **51. C. flava.**

Bract of lowest pistillate spike not sheathing.

D. Perigynia with beak entire or shallowly bidentate with very short teeth.

Perigynia glaucous-green.

Pistillate spikes drooping; plants loosely long-stoloniferous; terminal spike staminate . . . . . **34. C. limosa.**

Spikes erect, the terminal pistillate at top; culms densely tufted, sending forth long horizontal stolons . . . . . **35. C. buxbaumii.**

Perigynia not glaucous-green.

Terminal spike in some plants pistillate and linear-cylindric or staminate only at apex, in others staminate . . . . . **36. C. parryana.**

Terminal spike staminate or pistillate at top and staminate below; not pistillate and linear-cylindric.

Terminal spike staminate.

Culms few-leaved, purplish-tinged at base, the lower leaves reduced to bladeless sheaths . . . . . **37. C. podocarpa.**

Culms many-leaved, clothed at base with dried-up leaves of previous year, not purplish-tinged at base.

Perigynia flat . . . . . **38. C. tolmiei.**

Perigynia round in cross section, many-nerved . . **39. C. raynoldsii.**

Terminal spike pistillate at top and staminate below.

Perigynia small, 2.5 mm. long or less, triangular in cross section. **40. C. halleri.**

Perigynia larger, 2.5 to 5 mm. long, compressed or subtriangular.
Spikes contiguous, sessile or short-peduncled, forming a dense head.
Culms stiff, erect; scales with conspicuous white hyaline apex and upper margins . . . . . **41. C. albo-nigra.**
Spikes not contiguous, the lowest spike (or spikes) strongly peduncled, usually distant, erect or nodding.
Spikes 3 to 5, not oblong-cylindric; walls of perigynia not papery; perigynia 2.5 to 4.5 mm. long, dull green to brownish black, nerveless ventrally or obscurely nerved; scales about the length of the perigynia.
Perigynia slightly inflated and subtriangular, not strongly compressed . . . . . **42. C. atrosquama.**
Perigynia strongly compressed . . . . . **43. C. chalciolepis.**
Spikes 6 to 10, oblong-cylindric; walls of perigynia papery; perigynia 5 mm. long, light green, finely 3-nerved ventrally; scales much shorter than the perigynia . . . **44. C. mertensii.**
DD. Perigynia deeply bidentate with stiff slender teeth.
Perigynia ascending; rootstocks short-creeping; lower sheaths more or less strongly filamentose; culms sharply triangular above leaves. **53. C. vesicaria.**
Perigynia spreading at maturity; plants cespitose and sending forth long horizontal stolons; lower sheaths not filamentose; culms bluntly triangular above leaves . . . . . **54. C. rostrata.**

1. Carex hepburnii Boott. On a wind-swept rocky summit above Sexton Glacier. Alta. to Colo., Wash., and southeastern Alaska.—Culms 2 to 15 cm. high; leaf blades acicular; spike 5 to 12 mm. long; perigynia 3 to 4 mm. long, elliptic-ovate, membranaceous, stipitate, the beak hyaline-tipped.

2. Carex pyrenaica Wahl. Frequent on rocky alpine slopes. Mack. to Colo., Oreg., and southeastern Alaska; also in Eurasia.—Culms 3 to 20 cm. high, slender, wiry; leaves 2 or 3 to a culm; spike 5 to 20 mm. long; scales chestnut-tinged; perigynia 3 to 4 mm. long, obscurely triangular, long-beaked, the beak obliquely cut.

3. Carex nigricans C. A. Meyer. Abundant in wet meadows above timber line; sometimes in meadows at lower altitudes, as at Grinnell Lake and below Granite Park. Alta. to Colo., Calif., and Alaska.—Culms 5 to 20 cm. high, stiff, firm; leaves 4 to 9 to a culm; spike 8 to 15 mm. long; scales tinged with dark brown; perigynia 4 mm. long, obscurely triangular, long-beaked, the beak obliquely cut.

One of the most abundant plants in alpine meadows, often forming large pure stands. To a large extent it replaces the grasses that commonly compose the alpine meadows farther south in the Rockies.

4. Carex gynocrates Wormskj. In a marsh along Swiftcurrent Creek below Lake McDermott; abundant in this one locality, growing with *Petasites sagittata*, *Eriophorum*, etc. Greenl. to Alaska, south to N. Y., Mich., and Colo.; also in Siberia.—Culms 10 to 30 cm. high, smooth; leaf blades filiform; spike bractless, 5 to 15 mm. long; perigynia 3 mm. long, biconvex, subcoriaceous, strongly beaked, the apex hyaline.

5. Carex douglasii Boott. Plains near east entrance, *Umbach*. Man. to B. C., south to Nebr., N. Mex., and Calif.—Culms 6 to 30 cm. high; leaf blades 1 to 2.5 mm. wide; spikes oblong-elliptic, aggregate in an oblong-ovoid head; perigynia concealed by scales, lanceolate, 4 mm. long.

6. Carex praegracilis W. Boott. On a dry gravelly slope along the railroad near Belton. Man. to Yukon and B. C., south to Kans., Mex., and southern Calif. (*C. marcida* Boott).—Culms 20 to 50 cm. high; leaf blades 1.5 to 3 mm. wide; spikes ovoid; perigynia nearly concealed by scales, blackish in age, 3 to 4 mm. long, 1.5 mm. wide.

7. Carex sartwellii Dewey. Frequent in wet open places about the east entrance. N. Y. to Mont., south to Ill. and Colo.—Culms 40 to 70 cm. high, rough above; leaf blades 2.5 to 4 mm. wide; spikes densely aggregate in an oblong head; perigynia 2.5 to 4 mm. long, very short-beaked.

8. Carex hoodii Boott. On shaded cliffs near Many Glacier Hotel; in deep damp woods at Sun Camp. Alta. to B. C., south to Colo. and Calif.—Densely cespitose; culms 30 to 60 cm. high; leaf blades 1.5 to 3.5 mm. wide; head 1 to 2 cm. long; perigynia ascending, serrulate to middle, 4 to 5 mm. long, margined above, sharply bidentate.

9. Carex diandra Schrank. Common in sphagnum bog at Johns Lake. N. S. to Alaska, south to Pa., Colo., and in the mountains to southern Calif.; also in Eurasia.—Culms loosely cespitose, slender, 30 to 70 cm. high; leaf blades 1 to 2.5 mm. wide; head 2.5 to 5 cm. long, not interrupted, compound; perigynia not concealed by scales, coriaceous, conspicuously rough-beaked.

10. Carex laeviculmis Meinshaus. In a low thicket along Snyder Creek. Alaska to Mont., south to Calif.; also in Siberia.—Culms 30 to 70 cm. high, weak; leaf blades 1.5 to 2 mm. wide, flat, soft; spikes 3 to 8, with 3 to 10 perigynia; scales with sharply defined green midvein; perigynia 2.5 to 3 mm. long, the beak slightly bidentate.

11. Carex interior Bailey. Marsh near Swiftcurrent Creek below Lake McDermott. Me. to B. C., south to Pa., Ind., northern Mex., and Calif.—Culms 20 to 40 cm. high, stiff, slender, wiry; leaf blades 1 to 2 mm. wide; spikes 2 to 4, approximate; scales very obtuse, with light center; perigynia ovoid, 2.5 mm. long, abruptly short-beaked, he teeth short.

12. Carex leptopoda Mackenz. Common in deep woods and on lake shores at middle altitudes; sometimes on open slopes, and occasionally found above timber line. B. C. to Mont. and Calif.—Rootstocks slender, elongate; culms slender, 30 to 75 cm. high; leaf blades 2.5 to 5 mm. wide; spikes 4 to 7, narrow, approximate; scales short; perigynia 3.5 to 4.5 mm. long, substipitate, the beak shallowly bidentate.

13. Carex athrostachya Olney. Swales near east entrance, *Umbach*. Sask. to Yukon, south to Colo. and Calif.—Culms 5 to 30 cm. high; leaf blades 1.5 to 2.5 mm, wide; spikes 4 to 15, densely aggregate; perigynia exceeding scales, lanceolate-ovate. 3 to 4 mm. long, slenderly beaked, hyaline at orifice.

14. Carex aenea Fernald. Low thicket along Swiftcurrent Creek below Lake McDermott. Lab. to Yukon, south to Conn., Mont., and B. C.—Culms 40 to 90 cm. high; leaf blades 2.5 to 4 mm. wide; spikes 3 to 12 in a flexuous head; scales light brownish, hyaline-margined; perigynia ascending, ovate, 4 mm. long.

15. Carex bebbii Olney. On sandbar along Lake McDonald near Lewis's. Newf. to B. C., south to N. J. and Mont.—Culms 20 to 80 cm. high, rough beneath head; leaf blades 2 to 4.5 mm. wide; spikes 5 to 10, closely aggregate; perigynia brownish, ascending, ovate, 3 to 4 mm. long.

16. Carex phaeocephala Piper. Frequent on open rocky slopes at middle and high altitudes. Alta. to southeastern Alaska, south to Colo. and Calif.—Leaf blades 1.5 to 2 mm. wide, more or less involute; spikes 2 to 5 (7), aggregate; scales reddish brown, strongly hyaline-margined; perigynia ascending, oblong-ovate, obscurely nerved ventrally, short-beaked.

17. Carex praticola Rydb. In dense moist woods along Swiftcurrent Creek below Lake McDermott; in low aspen thickets about the east entrance. Greenl. to Alaska, south to Me., Colo., and northern Calif.—Culms 25 to 60 cm. high; leaf blades 1 to 2 mm. wide; spikes 2 to 6; scales shining; perigynia appressed, ovate-lanceolate, 4.5 to 6.5 mm. long, nerveless ventrally, short-beaked.

18. Carex piperi Mackenz. Fields near east entrance, *Umbach*. B. C. to Alta., south to Wyo. and Oreg.—Culms 30 to 80 cm. high; leaf blades 2 to 3.5 mm. wide,

spikes 3 to 9; scales shining; perigynia appressed, ovate-lanceolate, 4 to 5 mm. long, nearly nerveless ventrally, rather short-beaked.

19. Carex festivella Mackenz. Frequent on the east slope at nearly all altitudes; in moist woods or thickets or on high open slopes. Alta. to B. C., south to N. Mex., Ariz., and Calif.—Leaf blades 2.5 to 4 mm. wide; spikes 3 to 8, densely aggregate; scales ovate, dark reddish brown; perigynia numerous, lightly nerved ventrally, the beak one-third the length of body.

20. Carex nubicola Mackenz. Abundant in meadows and on rocky slopes above timber line. Alta. to Wash., south to Colo. and Calif.—Leaf blades 2 to 3 mm. wide; spikes 4 to 7, densely aggregate; scales ovate, blackish; perigynia 15 to 30, ovate, nerveless ventrally, abruptly beaked, the beak half the length of body.

21. Carex pachystachya Cham. On a moist shaded bank at the east entrance. Alaska to Alta., south to Colo. and Calif.—Culms 30 to 80 cm. high; leaf blades 2 to 4 mm. wide; spikes 4 to 8; scales narrowly hyaline-margined; perigynia 3.5 to 4 mm. long, ovate, nerveless ventrally, the beak half the length of body.

22. Carex preslii Steud. Common in deep woods at middle altitudes, and on rocky slopes and in meadows above timber line. B. C. to Mont. and Oreg.—Culms 25 to 75 cm. high; leaf blades 1.5 to 4 mm. wide; spikes 3 to 8, well defined; scales reddish brown, narrowly margined; perigynia ovate, 3.5 mm. long, abruptly beaked, the beak 1 mm. long.

23. Carex disperma Dewey. Frequent at low or middle altitudes, in bogs, swampy woods, or wet thickets; abundant in some localities and forming dense mats of loosely interlaced leaves and stems. Newf. to Alaska, south to N. J., Ind., N. Mex., and Calif.; also in Eurasia.—In large clumps but rootstocks slender; culms weak, 15 to 60 cm. high; leaf blades 1 to 1.5 mm. wide; perigynia elliptic-ovoid, 2 mm. long, finely nerved, the minute beak smooth.

24. Carex lachenalii Schkuhr. Moist meadow at Sperry Glacier. Greenl. to Alaska, south to Mont.; also in Eurasia.—Culms stiff, erect, 7 to 40 cm. high, rough above; leaf blades 1 to 3 mm. wide; spikes 2 to 6, the terminal strongly tapering; perigynia 2 to 3.5 mm. long, several-nerved, abruptly short-beaked.

25. Carex canescens L. Open bog near Swiftcurrent Creek below Lake McDermott. Lab. to Alaska, south to Va. and Calif.; also in Eurasia, S. Amer., and Australia.—In large clumps, the culms 25 to 80 cm. high, slender; leaf blades 2 to 4 mm. wide, glaucous; spikes 4 to 9, many-flowered; perigynia appressed-ascending, 1.8 to 2.8 mm. long, faintly few-nerved, minutely beaked, the orifice entire or emarginate.

26. Carex arcta Boott. Abundant in a wet thicket at the upper end of Lake McDonald. N. B. to B. C., south to N. Y., Mont., and northern Calif.—Culms 15 to 80 cm. high; leaf blades 2 to 4 mm. wide; spikes 5 to 15, many-flowered, aggregate; perigynia 2 to 3 mm. long, many-nerved, ascending or somewhat spreading.

27. Carex leptalea Wahl. Frequent on the east slope at low and middle altitudes, in bogs, marshes, or low thickets. Lab. to Alaska, south to Fla., Tex., Colo., and northern Calif.—Densely tufted; culms 20 to 60 cm. high, very slender; leaf blades 0.5 to 1.25 mm. wide; spikes 4 to 15 mm. long; perigynia 2.5 to 4.25 mm. long, oblong-elliptic, membranaceous.

28. Carex geyeri Boott. Frequent on the east slope, at middle altitudes, or above timber line, on open gravelly slopes. Alta. to Wash., south to Colo., Utah, and northern Calif.—Rootstock woody, elongate; culms up to 35 cm. high, very rough, leaf blades thick, 2 to 3.5 mm. wide; perigynia 1 to 3.6 mm. long, obtusely triangular, very minutely beaked.

29. Carex filifolia Nutt. Hills near east entrance. Sask. to Yukon, south to Tex., N. Mex., and Wash.—Densely cespitose, the culms 8 to 30 cm. high; spike 1 to 2 cm.

long, with 5 to 10 perigynia; scales strongly bright white margined; perigynia 3 mm. long, obovoid-globose, rounded on the angles.

30. Carex scirpoidea Michx. Near a snow bank on Altyn Mountain; wet mossy cliffs at Baring Falls. Greenl. to Alaska, south to N. Y., Mich., Mont., and B. C.—Rootstocks creeping; culms 20 to 35 cm. high, purplish at base; spikes 1.5 to 3 cm. long; scales ciliate; perigynia 3 mm. long, flattened-triangular, short-beaked.

31. Carex rossii Boott. Frequent on the east slope at middle altitudes, in deep woods or in wet meadows. Mich. to Yukon, south to Colo. and Calif.—Rootstocks stout; culms 5 to 25 cm. high, wiry; leaf blades 1 to 2.5 mm. wide; staminate spike conspicuous, 3 to 10 mm. long; perigynia 3.25 to 4.5 mm. long, strongly stipitate, the beak deeply bidentate.

32. Carex aurea Nutt. At low and middle altitudes in moist soil, usually at the edge of water; infrequent. Newf. to Yukon, south to Conn., Mich., N. Mex., and Calif.—Leaf blades 2 to 4 mm. wide; bracts sheathing; pistillate spikes 2 to 5, on erect exserted peduncles; scales usually reddish brown tinged; perigynia ascending, broadly oval, 2 mm. wide, many-nerved, subumbonate.

33. Carex capillaris L. Occasional on open rocky slopes just below Sperry Glacier. Greenl. to Alaska, south to N. H., Mich., Colo., and Nev.; also in Eurasia.—Culms 5 to 60 cm. high, slender; leaf blades 1 to 2 mm. wide; pistillate spikes 2 to 4; scales broadly hyaline-margined; perigynia ovoid, appressed, 2.5 to 3 mm. long, the beak slender, conic.

34. Carex limosa L. Abundant in sphagnum bogs at Johns and Fish lakes. Lab. to Alaska, south to N. J., Iowa, Mont., and Wash.; also in Eurasia.—Culms 15 to 60 cm. high, sharply triangular; leaf blades glaucous, 1.5 to 3 mm. wide; pistillate spikes 8 to 30-flowered; scales acute or short-cuspidate; perigynia broadly ovate, flattened, 2-edged, 2.5 mm. long, several-nerved.

35. Carex buxbaumii Wahl. Boggy meadow along Swiftcurrent Creek below Lake McDermott; abundant in sphagnum bog at Johns Lake. Greenl. to Alaska, south to Ga., Ark., Colo., and Calif.; also in Eurasia.—Culms 20 to 90 cm. high, strongly reddish purple at base; lower sheaths filamentose; leaf blades 2 to 4 mm. wide; scales awned; perigynia numerous, shorter than scales, 3 to 4 mm. long, lightly many-nerved.

36. Carex parryana Dewey. Open rocky slope at Gunsight Pass. Hudson Bay to Alta., south to N. Dak. and Colo.—Stoloniferous; culms 10 to 35 cm. high; leaf blades 2.5 to 4 mm. wide; spikes 1 to 5, approximate; perigynia 2.5 mm. long, flattened and sharp-edged, the beak minute, bidentulate.

37. Carex podocarpa R. Br. Abundant in moist meadows and on rocky slopes above timber line; occasionally found on moist rocky slopes at lower altitudes. Northern Alaska, south to Mont. and Idaho.—Rootstocks stout; culms 20 to 40 cm. high, slender; leaf blades 2 to 4 mm. wide; pistillate spikes 2 to 4, oblong or linear-oblong, drooping; pistillate scales brownish black, the midvein nearly obsolete; perigynia ovate, flat, nerveless, 4 mm. long; achenes stipitate.

38. Carex tolmiei Boott. Abundant above timber line, in meadows and on rocky slopes. Alta. to Alaska, south to Wyo. and Wash.—Rootstocks tough, densely matted; culms 25 to 50 cm. high; leaf blades 2.5 to 4.5 mm. wide; pistillate spikes 3 to 6, spreading, oblong; pistillate scales with conspicuous midvein; perigynia flat, 3 mm. long; achenes short-stipitate.

Both this and *C. podocarpa* are common in all the alpine meadows, and they are very conspicuous because of their handsome dark spikes.

39. Carex raynoldsii Dewey. Frequent on the east slope in woods or thickets, at low and middle altitudes, and on open slopes above timber line. Alta. to Wash., south to Colo. and Calif.—Rootstocks stout; culms 20 to 40 cm. high; leaf blades

3 to 8 mm. wide; pistillate spikes 2 to 3, erect, oblong; scales blackish, with light midvein; perigynia 4.5 mm. long, oblong-oval, the short beak bidentate.

40. Carex halleri Gunn. Edge of a pool in marsh along Swiftcurrent Creek below Lake McDermott. Greenl. to Alaska, south to Ont. and N. Mex.; also in Eurasia.—Culms 15 to 60 cm. high, slender; leaf blades 1 to 3 mm. wide; spikes 2 to 4, clustered, erect, sessile or short-peduncled, closely 8 to 25-flowered; scales black; perigynia minutely bidentate.

41. Carex albo-nigra Mackenz. Mount Henry, *Umbach.* Mont. to Colo., Ariz., and Utah.—Culms 15 to 30 cm. high; leaf blades 3 mm. wide; spikes usually 3, closely 8 to 15-flowered; midvein of scales nearly obsolete; perigynia blackish, 3 mm. long, minutely roughened.

42. Carex atrosquama Mackenz. Occasional on the moraine of Grinnell Glacier. Alta. and B. C. to Mont. and Idaho.—Culms 30 to 45 cm. high, slender; leaf blades 25 to 35 mm. wide; spikes 3 or 4, oblong, densely 15 to 30-flowered; scales black, with obsolete midvein; perigynia 3.25 mm. long, olive-green, abruptly and minutely beaked.

43. Carex chalciolepis Holm. In marsh at Grinnell Lake. Mont. to Nev., south to Colo. and Ariz.—Culms 20 to 70 cm. high, slender; leaf blades 3 to 6 mm. wide; spikes 2 to 4, the lateral ones ovoid, rather short-peduncled; scales very thin, copper-brown, the midvein indistinct; perigynia 3 to 4 mm. long, obovate, shorter than the scales, granular-roughened; achenes short-stipitate.

44. Carex mertensii Prescott. Frequent at middle altitudes, in moist woods or thickets; sometimes found on open slopes above timber line. A handsome species, ranging from Alaska to Mont. and northern Calif.—Culms 30 to 100 cm. high, sharply triangular, rough; leaf blades 4 to 7 mm. wide; spikes 1 to 4 cm. long; scales acute, with light midvein; perigynia numerous, appressed, tapering at apex, minutely beaked.

45. Carex kelloggii W. Boott. Common at middle altitudes, in wet meadows or marshes or along streams; also in subalpine meadows. Alaska to Calif., east to Mont. and Colo.—Culms 30 to 70 cm. high, slender; staminate spike usually one; pistillate spikes 3 to 5, sessile or nearly so, linear, 1.5 to 4 cm. long, 4 to 6 mm. wide; scales with broad light-colored center; perigynia light green, 2.5 mm. long, strongly stipitate.

46. Carex substricta (Kükenth.) Mackenz. In willow thickets or low open places about the east entrance; in boggy meadows along Swiftcurrent Creek below Lake McDermott. Me. to Sask. and Mont., south to N. Y. and Nebr.—Culms 60 to 140 cm. high; staminate spikes 2 or 3; pistillate spikes 2 to 4, sessile or short-peduncled, linear, 2 to 7 cm. long, 4 to 6 mm. wide; scales with broad light-colored center; perigynia 3 mm. long, obovate, stipitate.

47. Carex nebraskensis Dewey. About a dried-up pool near the east entrance. S. Dak. to Kans., west to Calif. and B. C.—Culms 25 to 100 cm. high; leaf blades 4 to 8 mm. wide, flat; staminate spikes 1 or 2; pistillate spikes 2 to 5, sessile or short-peduncled; scales with light midvein; perigynia 3 to 3.5 mm. long.

48. Carex lanuginosa Michx. In low open ground, or in low thickets, about St. Mary and the east entrance. N. S. to B. C., south to Tenn., Mo., N. Mex., and Calif.—Stoloniferous; culms 60 to 90 cm. high, rough above, reddened and filamentose at base; staminate spikes 1 to 3; pistillate spikes 1 to 3, 1 to 5 cm. long; scales sharp-pointed; perigynia ovoid, the beak strongly bidentate.

49. Carex lasiocarpa Ehrh. Abundant in sphagnum bog at Fish Lake. Newf. to B. C., south to N. J., Iowa, and Colo.; also in Eurasia.—Stoloniferous; culms 60 to 90 cm. high, smooth, strongly reddened and filamentose at base; staminate spikes 1 to 3; pistillate spikes 1 to 3, 1 to 5 cm. long; scales sharp-pointed; perigynia oval-ovoid, the beak sharply bidentate.

50. Carex viridula Michx. On the rocky beach of Lake St. Mary at Sun Camp. Newf. to southeastern Alaska, south to N. J., Colo., and northern Calif.—Culms 7 to 40 cm. high; leaf blades 1.5 to 3 mm. wide; staminate spike sessile or nearly so; pistillate spikes 2 to 10, aggregate or the lower separate; scales much shorter than the perigynia, the latter white-tipped.

51. Carex flava L. Common at low and middle altitudes, on lake shores or stream banks or in bogs. Newf. to southeastern Alaska, south to N. J., Ohio, Mont., and B. C.—Culms 15 to 60 cm. high; leaf blades 2 to 5 mm. wide; yellowish green; staminate spike sessile or stalked; pistillate spikes 1 to 4, the lower separate; scales strongly reddish-tinged; perigynia reddish-tipped.

52. Carex miliaris Michx. Common at low and middle altitudes, in bogs or low thickets and meadows, or along streams; sometimes in meadows above timber line. Lab. to B. C., south to Me. and Mont.—Rootstocks creeping; culms 30 to 60 cm. tall, smooth; leaf blades 2 mm. wide; staminate spikes 1 or 2; pistillate spikes 1 to 3, oblong-cylindric; perigynia faintly nerved, scarcely inflated, 2 to 3 mm. long, exceeding the scales, the beak entire or nearly so.

53. Carex vesicaria L. Common at low and middle altitudes, in bogs or low thickets, or on brushy hillsides. Que. to B. C., south to Pa., Ohio, and Calif.—Culms 30 to 90 cm. high; leaf blades 3 to 6 mm. wide; staminate spikes 2 to 4, pistillate spikes 1 to 3, oblong-cylindric, 2.5 to 7 cm. long; scales sharp-pointed; perigynia 5 to 8 mm. long, yellowish green.

54. Carex rostrata Stokes. Common at low and middle altitudes, in low thickets, wet meadows, marshes, or sphagnum bogs. Lab. to northern Alaska, south to Del., N. Mex., and Calif.—Culms stout, 30 to 120 cm. high; leaf blades 2 to 12 mm. wide; staminate spikes 2 to 4; pistillate spikes 2 to 4, cylindric, 5 to 15 cm. long; scales sharp-pointed; perigynia ovoid, yellowish, 4 to 8 mm. long.

Very abundant in some localities. Near the east entrance there are extensive meadows which are cut for hay that are covered almost exclusively with this sedge. The plants are large and coarse, and often form great tufts in bogs.

15. ARACEAE. Arum Family.

1. LYSICHITON Schott.

1. Lysichiton kamtschatcensis Schott. WESTERN SKUNKCABBAGE. In deep swamps at low altitudes on the west slope; flowering in spring. Alaska to Calif. and Mont.; also in eastern Asia.—Plants glabrous, succulent; leaves elliptic to lance-oblong, 30 to 50 cm. long, acute; flowers small, in a dense clublike spike, this surrounded by a large lemon-yellow corolla-like spathe.

The eastern skunkcabbage (*Spathyema foetidum*) belongs to this family. False hellebore (species of *Veratrum*) is sometimes known as skunkcabbage in the West.

16. LEMNACEAE. Duckweed Family.

1. LEMNA L. DUCKWEED.

Plants floating on water, consisting of a thallus-like frond, without leaves, each frond with a slender rootlet; flowers minute, borne on the upper side of the frond.

Frond oblong, 5 to 10 mm. long . . . . . **1. L. trisulca.**
Frond oval or rounded, 2 to 3 mm. long . . . . . **2. L. minor.**

1. Lemna trisulca L. Collected in ponds at east entrance by Umbach. Widely distributed in N. Amer., Eur., Asia, and Australia.—Plants bright green, submerged or floating, several plants usually attached to each other.

2. Lemna minor L. Collected in ponds at east entrance by Umbach. Widely distributed in N. Amer., Eur., Asia, and Australia.—Fronds floating, solitary or a few together.

17. JUNCACEAE. Rush Family.

Grasslike annual or perennial herbs, with narrow leaves; flowers small, green or brown; sepals and petals each 3, scalelike; stamens 6 or 3; fruit a 1 or 3-celled capsule, containing 3 to many seeds.

Plants glabrous; leaf sheaths open; seeds numerous . . . . . **1. JUNCUS.**
Plants hairy, at least on the edges of the leaves; leaf sheaths closed; seeds 3. **2. JUNCOIDES.**

1. JUNCUS L. Rush.

Leaves flat or terete; flowers in heads, cymes, or panicles, each flower with a bract and sometimes 2 bractlets at the base; stamens 6 or 3; capsule 1 or 3-celled; seeds often with tail-like appendages at the ends.

Lowest bract of the inflorescence terete, appearing like a continuation of the stem, the inflorescence apparently lateral.
Seeds with a tail-like appendage at each end; flowers 1 to 5.
Capsule acute; lowest bract usually twice as long as the inflorescence or longer; upper leaf sheaths usually with blades . . . . . **1. J. parryi.**
Capsule obtuse or shallowly notched; bract only slightly, if at all, longer than the inflorescence; leaf sheaths without blades, merely bristle-pointed. **2. J. drummondii.**
Seeds without tail-like appendages; flowers often more numerous.
Sepals and petals green or straw-colored . . . . . **3. J. filiformis.**
Sepals with a dark brown stripe on each side of the midrib . . . . . **4. J. balticus.**
Lowest bract not appearing as a continuation of the stem or, if so, channeled on the upper side.
Flowers not in heads, inserted singly on the branches of the inflorescence; leaves flat, with their faces turned to the stem.
Plants annual, branched, usually 5 to 15 cm. high; inflorescence more than half the height of the plant; capsule rounded at the apex . . . **5. J. bufonius.**
Plants perennial, simple, tufted, usually 25 to 50 cm. high; inflorescence very short, less than one-tenth the height of the plant; capsule notched at the apex . . . . . **6. J. confusus.**
Flowers in dense heads; leaves various.
Leaves compressed, inserted with one edge toward the stem.
Stamens 6; ligule of the sheath usually produced into small auricles. **7. J. saximontanus.**
Stamens 3; ligule without auricles . . . . . **8. J. ensifolius.**
Leaves terete, or flat, but with one face turned toward the stem.
Leaves flat, not hollow, inserted with one face toward the stem, without cross partitions.
Seeds with tail-like appendages . . . . . **9. J. regelii.**
Seeds not appendaged . . . . . **10. J. longistylis.**
Leaves terete or channeled on the upper surface, hollow, provided inside with cross partitions.
Leaves channeled along the upper side.
Heads 2 to 5, about 6 mm. broad; sepals pale brown . . . . **11. J. alpinus.**
Head 1, 8 to 12 mm. broad; sepals very dark brown. **12. J. mertensianus.**
Leaves channeled along the upper side.
Capsule 6 to 9 mm. long; stems usually leafy, about 1.5 mm. thick. **13. J. castaneus.**
Capsule 3 to 5 mm. long; stems naked or leafy only at the base, less than 1 mm. thick.

Capsule notched at the apex; lowest bract at the base of the head usually prolonged into a short terete blade; sepals dark purple or dark brown. **14. J. biglumis.**

Capsule obtuse; lowest bract without a blade; sepals cream-colored in flower, in age sometimes reddish . . . . . **15. J. triglumis.**

1. Juncus parryi Engelm. Frequent above timber line, in wet meadows or on open rocky slopes. B. C. to Calif., Colo., and Mont.—Plants 10 to 35 cm. high, densely tufted; leaf sheaths loose, brown, the blades 2 to 5 cm. long; sepals brown, 5 to 7 mm. long; capsule yellowish brown, 6 to 7 mm. long.

2. Juncus drummondii E. Mey. Common above timber line, in meadows or on rocky slopes; sometimes in moist woods at middle altitudes. Alaska to Calif., N. Mex., and Alta.—Plants 10 to 35 cm. high, usually densely tufted; sheaths close, pale brown, the blades bristle-like, 3 to 10 mm. long; sepals 5 to 7 mm. long, dark brown but green along the keel; capsule obtuse, about as long as the sepals.

3. Juncus filiformis L. Sandbar at edge of Lake McDonald; abundant in sphagnum bog at Fish Lake. Wash. to Utah, Pa., and Greenl.; also in Eur. and Asia.—Plants 20 to 60 cm. high, very slender, often in dense tufts; leaves reduced to pale brown sheaths; lowest bracts of the inflorescence often longer than the stem; flowers 6 to 10, in a loose cluster; sepals 2.5 to 3.5 mm. long; capsule obovoid, very obtuse, nearly as long as the sepals.

4. Juncus balticus Willd. Frequent on the east slope at low altitudes, in marshes or wet thickets, sometimes on open slopes, often about low places on prairie. Alaska to Calif., Mo., Pa., and Lab.; also in Eur. and Asia. (*J. ater* Rydb.)—Stems slender, 20 to 60 cm. high, rising at intervals from a stout creeping rootstock; leaves reduced to loose brownish sheaths; sepals 3 to 4 mm. long, lanceolate, acute; capsule narrowly ovoid, about as long as the sepals.

5. Juncus bufonius L. TOAD RUSH. Low muddy places about east entrance. Widely distributed in N. Amer. and in the other continents.—Plants slender, much branched from the base; leaves 0.5 to 1 mm. wide; sepals 4 to 6 mm. long, green with thin white margins; capsule oblong, obtuse, shorter than the sepals.

6. Juncus confusus Coville. Occasional on the east slope at middle altitudes, in woods or on open hillsides. B. C. to N. Mex. and Nebr.—Stems very slender; leaves less than 1 mm. wide, half to two-thirds as long as the stem; sepals about 4 mm. long, green, with a narrow brown stripe on each side and with broad thin whitish margins; capsule about as long as the sepals, pale brown.

7. Juncus saximontanus A. Nels. Frequent at low altitudes, in moist or wet woods or thickets or in mossy bogs. B. C. to Calif., N. Mex., and Alta.—Stems leafy, 20 to 50 cm. high, rising from creeping rootstocks; leaves iris-like, 5 to 20 cm. long, with interior cross partitions; heads 2 to 10 (rarely only 1), usually about 1 cm. wide; sepals dark brown, about 3 mm. long; capsule obtuse, short-beaked, about as long as the sepals.

8. Juncus ensifolius Wikstr. Frequent at low and middle altitudes, in bogs or along streams and lakes. Alaska to Calif., Utah, and Alta.—Stems 30 to 60 cm. high, from thick creeping rootstocks; leaves iris-like, 5 to 30 cm. long, 3 to 6 mm. wide; heads usually 2 or more, about 1 cm. broad; sepals dark brown, 3 mm. long; capsule usually slightly longer than the sepals.

9. Juncus regelii Buchenau. Occasional on the east slope at low and middle altitudes, on wet slopes or along streams and lakes. B. C. and Wash. to Utah and Mont.—Stems leafy, 20 to 50 cm. high; leaves 5 to 20 cm. long, 1 to 3 mm. wide; heads 1 to 3; sepals 4 to 5 mm. long, green, with broad, dark brown margins; capsule very obtuse, about as long as the sepals.

10. Juncus longistylis Torr. Occasional on the east slope at low altitudes, in wet thickets. Alta. to Calif., Mex., and S. Dak.—Stems 20 to 40 cm. high, slender,

leafy; leaves 1.5 to 3 mm. wide; heads 1 to 5, 1 cm. broad or larger; sepals 5 to 6 mm. long, brown, with thin pale margins; capsule brown, obtuse, shorter than the sepals.

11. Juncus alpinus Vill. Occasional at low and middle altitudes, in wet meadows or sphagnum bogs. Alaska to Wash., Nebr., Pa., and Greenl.; also in Eur. and Asia.—Stems leafy, 15 to 30 cm. high, from stout rootstocks; leaves 0.5 to 1 mm. thick; heads 3 to 12-flowered; sepals 2 to 2.5 mm. long, obtuse; capsule brownish, slightly longer than the sepals.

12. Juncus mertensianus Bong. Abundant above and near timber line, in wet meadows or on rock slides; sometimes at middle or even low altitudes, in moist woods or along streams. Alaska to Calif., N. Mex., and Alta.—Stems 10 to 30 cm. high, from thick rootstocks; leaves about 1 mm. thick; sepals about 4 mm. long; capsule dark brown, about as long as the sepals, obtuse or shallowly notched.

13. Juncus castaneus J. E. Smith. Open rocky slope, Gunsight Pass. Alaska to N. Mex., Newf., and Greenl.; also in Eur. and Asia.—Stems stout, 10 to 30 cm. high, from creeping rootstocks; leaves 1 to 2 mm. thick, 3 to 10 cm. long; heads 1 to 3, 3 to 12-flowered; sepals brown or dark brown, 4 to 7 mm. long; capsule dark brown, acute, often twice as long as the sepals.

14. Juncus biglumis L. Open rocky slope, Gunsight Pass. Alaska to Mont. and Greenl.; also in Eur. and Asia.—Stems 2.5 to 10 cm. high, loosely tufted, very slender; leaves 2 to 5 mm. long, about 1 mm. thick; head 1, 1 to 4-flowered; sepals 3 to 3.5 mm. long; capsule longer than the sepals.

Apparently the species has not been reported before from the United States.

15. Juncus triglumis L. Iceberg Lake, in wet meadow near snow banks. Alaska to N. Mex., N. Y., and Lab.; also in Eur. and Asia.—Stems very slender, 5 to 15 cm. high, loosely tufted; leaves 1 to 5 cm. long, 0.5 to 1 mm. thick; head 1, 1 to 5-flowered; sepals 3 to 4 mm. long; capsule about as long as the sepals.

2. JUNCOIDES Adans. Woodrush.

Perennials; leaves flat, hairy on the margins, at least at the base; flowers in loose panicles or in dense spikelike clusters, each flower with bractlets at the base, these usually toothed or lobed; stamens 6; capsule 1-celled; seeds not tailed.

Flowers sessile or nearly so in headlike or spikelike clusters.
  Flowers in 1 to 3 dense spikelike clusters, these nodding; sepals dark brown. **1. J. spicatum.**
  Flowers in several long-stalked spikes, these forming a corymb; sepals straw-colored or pale brown . . . . . **2. J. campestre.**
Flowers, at least many of them, solitary and slender-pediceled, forming a loose panicle.
  Sepals and capsule pale green; leaves thin, shining . . . . . **3. J. parviflorum.**
  Sepals and capsule dark brown; leaves thick, dull.
    Panicle drooping; seeds constricted at each end; sepals about 1.5 mm. long. **4. J. piperi.**
    Panicle erect; seeds not constricted; sepals about 3 mm. long . . **5. J. glabratum.**

1. Juncoides spicatum (L.) Kuntze. Common above timber line in meadows or on rocky slopes; occasional at middle or even low altitudes on open slopes or in moist woods or thickets. Alaska to Calif., N. Mex., N. H., and Greenl.; also in Eur. and Asia. (*Luzula spicata* DC.)—Stems slender, tufted, 10 to 30 cm. high, with 1 to 3 leaves; leaves 1 to 6 mm. wide; inflorescence 1 to 4 cm. long; sepals with thin pale margins; capsule shorter than the perianth.

2. Juncoides campestre (L.) Kuntze. Belton, in thin dry woods. Widely distributed in N. Amer., Eur., and Asia. (*J. comosum* Sheldon; *Luzula campestris* DC.)—Stems 15 to 40 cm. high, tufted; leaves 2 to 6 mm. wide; spikes 6 to 7 mm. thick; sepals 2 to 3 mm. long; capsule nearly as long as the sepals; seeds with a pale spongy appendage at one end.

3. Juncoides parviflorum (Ehrh.) Coville. Common at middle altitudes in moist woods or thickets; sometimes on rock slides above timber line. Alaska to Calif., N. Mex., N. Y., and Greenl. (*Luzula parviflora* Desv.)—Stems solitary or tufted, 30 to 70 cm. high, with 2 to 5 leaves; leaves 3 to 10 mm. wide, bright green; flowers solitary in the panicles or 2 or 3 together; sepals 1.5 to 2 mm. long; capsule slightly longer than the sepals; seeds brown.

4. Juncoides piperi Coville. Frequent above timber line, on rocky slopes or rock slides; also at east entrance, in willow thicket. Wash. and Oreg. to Mont.—Stems 20 to 40 cm. high, densely tufted; leaves 2 to 6 mm. wide, the basal ones short, about one-fourth as long as the stem; capsule equaling or slightly longer than the sepals; seeds yellow.

5. Juncoides glabratum (Hoppe) Sheldon. Common and often abundant above or near timber line, in meadows or on rock slides. Alaska to Wash. and Mont.; also in Eur. (*Luzula glabrata* Desv.)—Stems 20 to 50 cm. high, tufted; leaves 4 to 10 mm. wide, 3 to 10 cm. long; capsule about as long as the sepals.

In some places this species is very abundant and forms extensive pure stands.

18. LILIACEAE. Lily Family.

Perennial plants, sometimes with bulbs; leaves parallel-veined; flowers large or small, with 3 sepals and 3 petals; stamens 6; fruit dry or juicy.—The cultivated lilies, hyacinths, and daffodils and many other showy plants belong to this family.

Leaves linear or nearly so, with parallel sides, many times longer than wide (hollow in one species of *Allium*); fruit dry.
- Flowers 1 to 3; petals bearded inside, yellowish white . . **13. CALOCHORTUS.**
- Flowers more than 3, often very numerous; petals not bearded.
  - Flowers in umbels; plants with an onion odor . . . . . **6. ALLIUM.**
  - Flowers in dense or slender racemes; plants never with an onion odor.
    - Petals purplish blue, about 2 cm. long . . . . . **8. QUAMASIA.**
    - Petals never blue, much less than 2 cm. long.
      - Leaves very numerous, tough, rough-edged; stems usually about a meter high . . . . . **1. XEROPHYLLUM.**
      - Leaves few, succulent and easily broken, smooth-edged; stems usually less than 50 cm. high.
        - Flowers drooping, bronze and greenish yellow . . . **2. STENANTHIUM.**
        - Flowers not drooping, white, yellowish white, or greenish white.
          - Leaves with their edges turned toward the stem; plants with rootstocks. **3. TOFIELDIA.**
          - Leaves with their sides facing the stem; plants with bulbs. **4. ZYGADENUS.**

Leaves not linear, lanceolate or broader, not more than 5 times as long as wide, the sides curved, not parallel; fruit often juicy.
- Stems not leafy.
  - Flowers yellow; fruit a dry 3-angled capsule . . . . . **7. ERYTHRONIUM.**
  - Flowers white; fruit juicy, dark blue . . . . . **9. CLINTONIA**
- Stems leafy.
  - Flower one on each stem.
    - Flowers erect, pink or white; leaves ovate . . . . . **14. TRILLIUM**
    - Flowers recurved, yellow; leaves oblong . . . . . **15. FRITILLARIA.**
  - Flowers several or numerous on each stem.
    - Flowers green; fruit dry; plants usually a meter high or more, the stems not branched . . . . . **5. VERATRUM.**

Flowers white or yellowish; fruit juicy; plants usually much less than a meter high, the stems often branched.
Flowers in racemes or panicles at the ends of the stems, white; stems not branched . . . . . **10. VAGNERA.**
Flowers solitary at the ends of the branches or solitary or clustered in the leaf axils; stems nearly always branched.
Flowers greenish white, in the axils of the leaves; leaves pale on the under side . . . . . **11. STREPTOPUS.**
Flowers yellow or greenish yellow, solitary at the ends of the branches; leaves green . . . . . **12. DISPORUM.**

1. XEROPHYLLUM Michx.

1. Xerophyllum tenax (Pursh) Nutt. BEARGRASS. Common at middle altitudes, in thin or dense woods or on open slopes; frequent in meadows just above timber line, and occasional in woods at low altitudes. B. C. to Calif. and Mont.—Plants glabrous, 0.5 to 1.5 meters high, with thick woody rootstocks, the stem simple, leafy; leaves mostly basal, narrowly linear, 20 to 40 cm. long, green above, whitish underneath; flowers creamy white, long-stalked, in dense racemes; petals 5 to 8 mm. long; fruit a small capsule.

Known also as squawgrass, basketgrass, or bearpaw; there is no apparent explanation of the name beargrass. This is with little doubt the finest and most striking flower of the park, and it receives more attention than any other. In many places, especially near timber line, it often forms great patches which are almost a solid mass of the stately plumelike racemes (see pl. 41). One of these fields is a sight long to be remembered, and one which can be found only in the mountains of the Northwest. The beargrass reaches the eastern limit of its range in Glacier Park. It is said that during some seasons only a few plants bloom, while during others flowering plants abound everywhere. The plants bloom for a long time, beginning at the lowest altitudes; in 1919 a fine patch of them was in flower just below Sperry Chalets in early September, when snow fell. When the plants begin to bloom the racemes are globose, but as flowering proceeds they elongate and the pedicels finally stand erect. The flowers have a rather strong odor, which some people consider unpleasant. The sterile plants often form dense mats on steep slopes, and the leaves are so slippery that it is difficult to climb over them. The leaves are very tough, and they have rough edges almost as sharp as a knife; they were formerly employed by some of the northwestern Indians for making baskets. The specimens of *Xerophyllum* from Glacier Park are about intermediate in size of flowers between *X. tenax* and *X. douglasii* S. Wats. It seems very doubtful whether the latter is a distinct species.

2. STENANTHIUM (A. Gray) Kunth.

1. Stenanthium occidentale A. Gray. BRONZEBELLS. Frequent, but seldom very abundant, at nearly all altitudes; on open slopes, in woods, or in alpine meadows; seen on the west slope only at high altitudes. B. C. to Oreg., Mont., and Alta. (*Stenanthella occidentalis* Rydb.)—Plants 20 to 50 cm. high, glabrous, with bulbs; leaves linear or oblanceolate, usually 10 to 20 cm. long; flowers drooping, in racemes or panicles, pale yellow within, greenish yellow or more often bronze outside; petals about 1 cm. long, their tips spreading or recurved; capsule about 2 cm. long.

The plant is inconspicuous and often hidden among grasses or sedges. It grows usually in moist places, but plants were found on dry open slopes at the east entrance. Plants collected in a deep swamp had leaves as much as 4.5 cm. wide. The flowers have a characteristic spicy odor.

3. TOFIELDIA Huds. Bog-asphodel.

Plants with short rootstocks; leaves linear; flowers small, white, in dense recemes, each flower with 3 bractlets at the base of the calyx; petals without glands, persisting on the fruit; fruit a many-seeded capsule.

Stem very sticky above with short gland-tipped hairs; flower stem leafy. **1. T. intermédia.**

Stem glabrous; flower stem naked . . . . . **2. T. palustris.**

1. Tofieldia intermedia Rydb. Large bog-asphodel. Abundant in wet meadows and along brooks above timber line; occasionally found in cool wet places at lower altitudes. Alaska to Calif., Wyo., and Sask.—Stems 10 to 30 cm. high, often tinged with purple; leaves 5 to 20 cm. long, 2 to 5 mm. wide; petals 4 to 5 mm. long; capsule 5 mm. long.

Some plants in exposed places are only 2.5 to 5 cm. high. Bog-asphodel is conspicuous in flower, or when bearing its showy purplish capsules.

2. Tofieldia palustris Huds. Small bog-asphodel. Frequent about Gunsight Pass, in rocky places along brooks. Alaska, B. C., and Mont. to Minn., Que., and Greenl.; also in Eur.—Stems 4 to 15 cm. high; leaves all at the base of the stem, 2 to 10 cm. long.

Rydberg, in the Flora of the Rocky Mountains, apparently does not report this species from the western United States, but it has been reported from Glacier Park previously by Jones.

4. ZYGADENUS Michx.

Plants glabrous, with bulbs; leaves linear, mostly basal; flowers in racemes or panicles, stalked; petals and sepals each with a gland at the base; fruit a capsule.

Petals 6 to 8 mm. long . . . . . **1. Z. elegans.**
Petals 4 to 5 mm. long . . . . . **2. Z. paniculatus.**

1. Zygadenus elegans Pursh. Poison camas. Common, especially at high and middle altitudes; apparently rather scarce on the west slope; in woods, bogs, or moist meadows, sometimes on rock slides. Alaska to Nev., N. Mex., and N. Dak. (*Z. alpinus* Blankinship; *Anticlea alpina* Heller; *A. elegans* Rydb.)—Plants usually 10 to 40 cm. high, often forming dense clumps, the stems naked or leafy only at the base; leaves 6 to 25 cm. long; flowers greenish white or pale greenish yellow, in racemes or panicles.

The plants are poisonous to stock. They are most abundant above timber line. Plants of alpine localities (*Z. alpinus* Blankinship) are not as tall as those of low altitudes, and their flowers are often slightly smaller, but they grade insensibly into the larger form. Plants growing along the creek at St. Mary were 90 cm. high and had remarkably large panicles. The petals and sepals persist in fruit.

2. Zygadenus paniculatus (Nutt.) S. Wats. Death camas. Collected on plains at east entrance by Umbach. Wash. to Calif., N. Mex., and Mont. (*Toxicoscordion paniculatum* Rydb.)—Plants 30 to 60 cm. high; leaves 20 to 40 cm. long, 5 to 10 mm. wide; flowers in racemes or panicles, yellowish white.

The plant is poisonous if eaten.

5. VERATRUM L.

1. Veratrum viride Ait. False hellebore. Common at nearly all altitudes, in woods or on open slopes. B. C. to Oreg. and Mont. (*V. eschscholtzianum* Rydb.)—Stems 1 to 2 meters high, from thick rootstocks, somewhat hairy; leaves numerous, 10 to 30 cm. long, oblong to oval, sessile and sheathing at the base, with numerous conspicuous parallel veins; flowers panicled, the branches of the panicle drooping; petals 8 to 10 mm. long, without glands.

A very conspicuous plant, in the Rocky Mountain region sometimes erroneously known as skunkcabbage. In 1919 very few individuals were seen in flower. The

leaves are often badly eaten by insects. The plant is said to be poisonous to stock. The powdered roots of some species of *Veratrum* are used in insect powder, but the drug hellebore is obtained from a plant of the buttercup family. Small pieces of the dried roots of false hellebore were snuffed up the nose by the Blackfoot Indians as a remedy for headache.

6. ALLIUM L. Onion.

Plants glabrous, from bulbs, with a characteristic odor; flowers in umbels, the umbel with thin papery bracts at the base; fruit a small capsule.—The cultivated onions, garlic, and leek belong to the genus.

Leaves hollow; petals about 1 cm. long . . . . . **1. A. sibiricum.**
Leaves flat, not hollow; petals 4 to 6 mm. long.
  Flowers all or mostly replaced by bulblets . . . . . **2. A. fibrosum.**
  Flowers not replaced by bulblets.
    Umbel recurved; outer bulb coats not separating into fibers . . . **3. A. cernuum.**
    Umbel erect; outer bulb coats separating into fibers . . . . . **4. A. nuttallii.**

1. Allium sibiricum L. Purple onion. Frequent at middle altitudes and just above timber line; occasionally found at low altitudes, in moist meadows or in woods. Alaska to Oreg., Colo., N. Y., and Me.—Plants 30 to 60 cm. high; leaves 10 to 20 cm. long; flowers rose-colored or purplish pink, in large dense umbels.

A very handsome plant, often forming dense patches. As in other species, the sepals and petals persist in fruit. The bulbs have an extremely hot taste.

2. Allium fibrosum Rydb. On the east slope at low and middle altitudes, on open hillsides or in aspen woods; rare. Idaho, Mont., and Wyo.—Plants 20 to 30 cm. high, slender; bulbs with fibrous coats; petals 6 to 7 mm. long, but all or most of the flowers replaced by small bulbs.

3. Allium cernuum Roth. Nodding onion. Common at nearly all altitudes, in woods or thickets or on open slopes or rock slides. B. C. to N. Mex., W. Va., and N. Y. (*A. recurvatum* Rydb.)—Plants 30 to 60 cm. high, often in clumps; leaves 10 to 20 cm. long., 2 to 5 mm. wide; petals pale or deep pink, 5 mm. long, obtuse.

The Blackfoot Indians ate the bulbs raw, and used them for flavoring soups, etc.

4. Allium nuttallii S. Wats. Dry open hillside near foot of Sherburne Lake. Idaho to Ariz., Kans., and S. Dak.—Plants 10 to 30 cm. high, from large bulbs; leaves 10 to 15 cm. long, 2 to 3 mm. wide; petals 4 to 6 mm. long, acute, pink or white.

7. ERYTHRONIUM L.

1. Erythronium grandiflorum Pursh. Glacier lily. Common nearly everywhere on the east slope in open places or on brushy hillsides; on the west slope found chiefly at middle and high altitudes. B. C. and Wash. to Wyo. and Mont.—Plants glabrous, with bulbs; stems 20 to 40 cm. high, 1 to 5-flowered; leaves lanceolate to oval, sharp-pointed, 10 to 20 cm. long; petals yellow, 3 to 5 cm. long; fruit a 3-angled capsule, 3 to 4 cm. long.

Sometimes known as adder's-tongue or dog-tooth violet. Few flowers of the park attract as much attention as this, and few are as showy. Tourists get the impression that the plant grows only above timber line, for this is the only place where it is in flower during the tourist season, but in early spring the plant is common on the foothills of the east slope. It may be found in blossom all summer at high altitudes, the plants coming into flower very promptly as the snow melts; indeed, they are in bloom right up to the edges of the snow banks. The finest and most persistent display of the flowers in summer is at Iceberg Lake, but they are found in most similar situations. The petals usually hang on the flower for some time after they have withered. The bulbs are dug and eaten by bears. Specimens of *Erythronium* from Glacier Park have been determined as *E. obtusatum* Goodding, but they do not appear essentially different from typical *E. grandiflorum*.

8. QUAMASIA Raf.

1. Quamasia quamash (Pursh) Coville. CAMAS. Frequent at low altitudes, in woods, swamps, bogs, or meadows. B. C. to Calif., Utah, and Mont.—Plants glabrous, 30 to 60 cm. high, from bulbs; leaves basal, linear, 20 to 40 cm. long; flowers deep purplish blue, in loose racemes; petals about 2 cm. long, narrow; capsule 3-angled, 1 to 1.5 cm. long.

The word "camas" is much used in the geographic names of the region. The bulbs were formerly employed for food by the Indians of the Northwest. The Blackfoot Indians usually dug them in early or late summer after the flowers had fallen. The bulbs were baked by placing them in a deep hole in the ground with leaves and grass and heated stones, and above them a fire was kept burning. It is said that two days and nights were necessary for cooking them thoroughly.

9. CLINTONIA Raf.

1. Clintonia uniflora (Schult.) Kunth. QUEENCUP. PLATE 46, B. Common and often abundant at low and middle altitudes; usually in deep moist woods, but sometimes in open places. Alaska to Calif. and Mont.—Plants from slender creeping rootstocks; stem naked, 1 or rarely 2-flowered; leaves 2 to 5, usually 3, oblanceolate, 10 to 20 cm. long, with long scattered hairs; flowers pure white, about 2 cm. broad; fruit subglobose, nearly 1 cm. long, deep Prussian blue.

One of the handsomest flowers of the region. The plants often form great mats of dark green leaves, which are thickly studded with the starlike flowers. The fruit, too, is handsome, and particularly striking because of its unusual color; it is nearly flavorless, and falls from the stalk easily. The flowers, unfortunately, last only a short time, and most of them have disappeared by midsummer.

10. VAGNERA Adans. FALSE SOLOMON'S-SEAL.

Plants with rootstocks and with simple leafy stems; leaves broad, conspicuously parallel-veined; flowers small, white or yellowish white; fruit a globose berry.

Flowers in simple racemes.

Leaves usually folded, pale, ascending; flowers short-stalked . . . . **1. V. stellata.**

Leaves flat, green, spreading; flowers long-stalked . . . . . **2. V. sessilifolia.**

Flowers in panicles.

Leaves clasping, acute . . . . . **3. V. amplexicaulis.**

Leaves contracted at the base into a short narrow petiole, long-pointed. **4. V. racemosa.**

1. Vagnera stellata (L.) Morong. STAR SOLOMON'S-SEAL. Frequent, especially on the east slope, at low and middle altitudes, in swamps or moist woods. Alaska to Colo., Va., and Newf. (*Smilacina stellata* Desf.)—Plants 15 to 50 cm. high; leaves lance-oblong, 2 to 8 cm. long, sessile, minutely hairy beneath; petals 3 to 5 mm. long; fruit green, with 3 dark stripes, turning black.

2. Vagnera sessilifolia (Nutt.) Greene. Common at low and middle altitudes, in moist woods or thickets. Yukon to Calif., Wyo., and Mont. (*Smilacina sessilifolia* Nutt.)—Stems 20 to 50 cm. high; leaves narrowly or broadly lanceolate, 5 to 12 cm. long, minutely hairy beneath; petals 6 mm. long; fruit 5 to 8 mm. in diameter, red when ripe.

This is closely related to *V. stellata*, and it is rather doubtful whether it is a distinct species.

3. Vagnera amplexicaulis (Nutt.) Morong. Common on the east slope at low and middle altitudes, in moist woods or sometimes on open slopes. B. C. to Calif., N. Mex., and Alta. (*Smilacina amplexicaulis* Nutt.)—Plants 25 to 60 cm. high, finely hairy; leaves mostly ovate, 6 to 15 cm. long, green and often shining; petals 2 mm. long; fruit 5 to 6 mm. in diameter, at first green with dark red or purple dots, becoming red.

The plants often form dense patches.

4. Vagnera racemosa (L.) Morong. Occasional at low and middle altitudes, in moist woods or thickets. B. C. to Colo., Ga., and N. S. (*Smilacina racemosa* Desf.)—Plants 30 to 60 cm. high, finely hairy; leaves ovate or lanceolate, 6 to 12 cm. long, green; petals 2 mm. long; fruit similar to that of *V. amplexicaulis*.

11. STREPTOPUS Michx.

1. Streptopus amplexifolius (L.) DC. TWISTED-STALK. Common everywhere in moist or wet woods or thickets; frequent about bushes above timber line. Alaska to Oreg., N. Mex., N. C., and Greenl.; also in Eur.—Plants glabrous, 30 to 100 cm. high, from rootstocks; stems branched; leaves ovate, 5 to 12 cm. long, clasping, conspicuously parallel-veined; petals 8 to 12 mm. long, greenish white, with spreading tips; fruit bright red, oval, 1 to 1.5 cm. long.

When in flower the plant is not conspicuous, but when loaded with the handsome fruit it is very striking. The fruits are pendent below the leaves on slender stalks, and they are most conspicuous on slopes above the trails, where they are not hidden by the leaves. The slender flower stalks are abruptly bent, hence the name "twisted-stalk." The stems are commonly branched, but plants above timber line frequently have simple stems. The fruit is insipid and inedible. The leaves turn pale yellow in autumn.

12. DISPORUM Salisb. FAIRYBELLS.

Plants branched, with rootstocks, finely hairy; leaves ovate-lanceolate to oval, sharp-pointed, 3 to 10 cm. long, conspicuously parallel-veined, sessile or clasping; flowers yellowish white, 1 to 1.5 cm. long; fruit juicy.

Fruit usually broader than long, somewhat lobed, roughened with fine wartlike projections; stigma 3-parted . . . . . **1. D. trachycarpum.**

Fruit longer than broad, not lobed, narrowed to each end, smooth; stigma not parted. **2. D. oreganum.**

1. Disporum trachycarpum S. Wats. ROUGH FAIRYBELLS. Common in moist or wet woods and thickets at low and middle altitudes. B. C. to Man., N. Mex., and Ariz.—Plants 30 to 60 cm. high, with few branches; fruit about 1 cm. thick.

The fruit is short-stalked and hidden beneath the leaves; at first it is yellow but it soon turns orange and then deep red. When ripe it is very handsome, with a velvety appearance, and suggests a strawberry.

2. Disporum oreganum (S. Wats.) W. Mill. SMOOTH FAIRYBELLS. Frequent in the same situations as the last species. B. C. to Calif. and Mont.—Much like the last species except in form of fruit, the two usually growing together and equally common; fruit about 1 cm. long, usually somewhat shining, turning lemon-yellow and finally orange-red.

The fruit is scarcely as handsome as that of *D. trachycarpum*. In both species it is nearly flavorless.

13. CALOCHORTUS Pursh.

1. Calochortus elegans Lindl. MARIPOSA LILY. Frequent on open slopes, in meadows, or sometimes in woods, at nearly all elevations. Wash. to Calif., Utah, and Mont.—Plants glabrous, 10 to 20 cm. high, from bulbs; leaf one, 10 to 20 cm. long, 2 to 10 mm. wide; petals 12 to 20 mm. long and nearly as broad, much larger than the sepals, with a gland inside near the base; fruit a 3-angled capsule about 2 cm. long.

The flowers open early in the season and do not last long. The plants are usually scattered among grasses, and the delicate flowers suggest butterflies hovering over the meadows, a fact which doubtless suggested to the Spanish settlers of California the name "mariposa" (the Spanish word for butterfly). The species of *Calochortus* are most abundant on the Pacific coast; many of them are in cultivation.

14. TRILLIUM L.

1. Trillium ovatum Pursh. WAKE-ROBIN. Frequent on the west slope at low and middle altitudes, in moist woods or in swamps. B. C. to Calif., Colo., and Mont.—Plants 20 to 40 cm. high, glabrous, with rootstocks; leaves broadly ovate, 7 to 12 cm. long, sharp-pointed; flower long-stalked, the 3 petals pink or white, turning purplish; fruit a juicy berry.

In late summer the leaves turn pale and wither.

15. FRITILLARIA L.

1. Fritillaria pudica (Pursh) Spreng. YELLOW-BELL. East entrance, *Mrs. Otto Thompson*. B. C. to Calif., Utah, and Mont. (*Ochrocodon pudicus* Rydb.).—Plants glabrous, 10 to 30 cm. high, from scaly buds; leaves 3 to 10 cm. long, blunt; flowers 12 to 20 mm. long; capsule 3 to 4 cm. long.

The plant flowers in spring.

19. IRIDACEAE. Iris Family.

Perennial herbs with rootstocks; leaves narrow, their edges turned toward the stem; sepals and petals each 3, colored; stamens 3; fruit a capsule.

Flowers 10 to 12 mm. long, the sepals and petals alike; leaves 1 to 3 mm. wide.
1. SISYRINCHIUM.

Flowers 6 to 8 cm. long, the sepals and petals very unlike; leaves 5 to 10 mm. wide.
2. IRIS.

1. SISYRINCHIUM L.

1. Sisyrinchium mucronatum Michx. BLUE-EYED GRASS. A few plants found near a snow bank on Altyn Peak, and in a wet meadow below Lake McDermott. Alta. and Mont. to Md. and Ont.—Plants grasslike, 10 to 30 cm. high, glabrous, the stem leafy, narrowly winged; flowers few, purplish blue; capsule globose.

2. IRIS L.

1. Iris missouriensis Nutt. BLUE FLAG. Among aspens and in low places on the prairie near the east entrance. B. C. to Calif., N. Mex., and N. Dak.—Plants glabrous, 20 to 40 cm. high; leaves 10 to 40 cm. long, sharp-pointed, sword-shaped; flowers few, pale blue, the sepals recurved, the petals erect; capsule about 4 cm. long, 6-ridged.

A very handsome plant which, unfortunately, probably does not grow within the limits of the park.

20. ORCHIDACEAE. Orchis Family.

Perennial herbs, more or less succulent; leaves entire; flowers solitary or in spikes or racemes, very irregular; sepals 3; petals 3, the 2 lateral ones alike, the middle one (lip) usually very different, sometimes with a long or short spur at the base; stamens 3, but 1 or 2 of them abortive; fruit a capsule, containing very numerous small seeds.—All of our species grow upon the ground.

Plants without any green coloring; leaves all reduced to bracts.
1. CORALLORHIZA.

Plants green; leaves present.

Leaves 2, opposite at about the middle of the stem . . . . . **2. OPHRYS.**

Leaves 1 to many, some or all of them at the base of the stem, the stem leaves alternate.

Lip petal 15 to 20 mm. long.

Leaf 1, at the base of the stem . . . . . **3. CYTHEREA.**

Leaves numerous, scattered along the stem . . . . . **4. SERAPIAS.**

Lip petal 10 mm. long or usually shorter; leaves 1 to many.
Flower stem finely hairy, especially above, with gland-tipped hairs; leaves green blotched with silvery white, forming a flat rosette at the base of the stem . . . . . **5. PERAMIUM.**
Flower stems glabrous; leaves not blotched, not in a rosette.
Flower spikes twisted, the flowers in 3 longitudinal rows . . . **6. IBIDIUM.**
Flower spikes not twisted, the flowers not in rows . . . . **7. HABENARIA.**

1. CORALLORHIZA R. Br. Coralroot.

Plants glabrous, purplish or yellowish, with coral-like roots; leaves reduced to scales; flowers in spikes; lip with 2 lobes or teeth below the middle, the spur very small.

Lip yellowish or whitish, not spotted; plants yellowish . . . . . **1. C. innata.**
Lip purple or with purple spots; plants purplish.
Lip purple; stamen column nearly as long as the petals . . . . . **2. C. mertensiana.**
Lip white with purple spots; column half as long as the petals . . **3. C. multiflora.**

1. Corallorhiza innata R. Br. Woods at east entrance, *Umbach*. Alaska to Colo., Ga., and N. S.; also in Eur. (*C. corallorrhiza* Karst.)—Stems 10 to 30 cm. high, 3 to 12-flowered; flowers greenish yellow, about 1 cm. long; spur very small; capsule 8 to 12 mm. long.

2. Corallorhiza mertensiana Bong. Occasional at middle altitudes, in deep woods. Alaska to Calif. and Mont.—Plants 20 to 40 cm. high, stout, often in small colonies; flowers 10 to 20, the spur conspicuous; capsule 1.5 to 2 cm. long.

3. Corallorhiza multiflora Nutt. Occasional in deep moist woods at low and middle altitudes. Alaska to Calif., Fla., and N. S.—Plants stout, 20 to 50 cm. high; flowers 10 to 30, about 1.5 cm. long; capsule 1.5 to 2 cm. long.

2. OPHRYS L. Twayblade.

Plants low, with rootstocks; leaves 2, large and broad, opposite near the middle of the stem; flowers small, in slender racemes.

Lip narrow, deeply cleft, the lobes acute, linear-lanceolate; leaves as broad as long . . . . . **1. O. cordata.**
Lip notched at the apex, the short lobes rounded; leaves usually longer than broad.
Lips about 5 mm. long, not clawed . . . . . **2. O. caurina.**
Lip 8 to 9 mm. long, short-clawed . . . . . **3. O. convallarioides.**

1. Ophrys cordata L. Heartleaf twayblade. Frequent on the east slope at middle or low altitudes, in deep moist woods. Alaska to Oreg., N. Mex., Mich., N. J., and Lab.; also in Eur. and Asia. (*O. nephrophylla* Rydb.; *Listera cordata* R. Br.)—Stems 10 to 20 cm. high, glabrous or minutely pubescent above; leaves rounded-reniform, 2 to 4 cm. wide; flowers green, the lip 4 to 5 mm. long.

2. Ophrys caurina (Piper) Rydb. Small twayblade. Frequent on the east slope at middle altitudes, in deep moist woods. B. C. to Oreg. and Mont. (*Listera caurina* Piper.)—Stems 10 to 20 cm. high, finely glandular-hairy above; leaves rounded to broadly ovate, 3 to 6 cm. long, sometimes acutish; flowers greenish.

3. Ophrys convallarioides (Swartz) W. F. Wight. Large twayblade. Common at low and middle altitudes, in bogs, swamps, or deep moist woods. Alaska to Calif., Mich., Vt., and N. S. (*Listera convallarioides* Torr.)—Stems slender, 10 to 25 cm. high, finely glandular-hairy above; leaves rounded or oval, 3 to 5 cm. long, obtuse or rounded at the apex; flowers pale green.

3. CYTHEREA Salisb.

1. Cytherea bulbosa (L.) House. CALYPSO. Occasional at low altitudes in moist woods. Alaska to Calif., N. Mex., Mich., Me., and Lab. (*Calypso bulbosa* Oakes.)—Plants glabrous, the stem naked, 5 to 15 cm. high, from a bulblike base; leaf 1, rounded, 2 to 5 cm. long; flowers variegated, the sepals and petals 10 to 15 mm. long, magenta, the lip 15 to 20 mm. long, yellow-hairy within.

Sometimes known as Venus'-slipper. The plants flower early in the season.

4. SERAPIAS L.

1. Serapias gigantea (Dougl.) A. A. Eaton. HELLEBORINE. Collected by Vreeland in meadow near Lake McDonald. B. C. to Calif., Tex., and Mont. (*Epipactis gigantea* Dougl.)—Stem very leafy, from a rootstock, 30 to 70 cm. high, nearly glabrous; leaves ovate to narrowly lanceolate, 5 to 15 cm. long, with numerous conspicuous parallel veins; flowers 3 to 10, in a leafy raceme, greenish, with purple veins; lip 1.5 to 1.8 cm. long, not spurred; capsule 1.5 cm. long.

5. PERAMIUM Salisb.

1. Peramium decipiens (Hook.) Piper. RATTLESNAKE-PLANTAIN. Frequent at low and middle altitudes, in deep woods. Alaska to Calif., N. Mex., N. H., and Que.—Stems 20 to 40 cm. high, covered above with fine glandular hairs; leaves mostly at the base of the stem, forming a rosette or sometimes erect, lance-ovate, 4 to 6 cm. long, sharp-pointed, blotched with pale green; flowers 7 to 9 mm. long, greenish white, in a one-sided spike.

The dead stems often persist for one or two years.

6. IBIDIUM Salisb.

1. Ibidium romanzoffianum (Cham.) House. LADY'S-TRESSES. PLATE 47, B. Occasional on the east slope at low altitudes, in wet thickets; in sphagnum bogs on the west slope. Alaska to Calif., N. Mex., Pa., and Newf. (*I. strictum* House; *Spiranthes romanzoffiana* Cham.)—Plants stout, glabrous, 15 to 30 cm. high, from fleshy roots, the stems leafy; leaves linear, 5 to 15 cm. long; flowers 6 to 8 mm. long, in dense 3-angled spikes, white, sweet-scented; lip not spurred.

7. HABENARIA Willd. BOG-ORCHIS.

Plants glabrous, with 1 to many leaves, the roots fleshy; flowers green or white, in racemes.

Leaves 1 or 2, at the base of the stem.
  Leaf 1; spur about as long as the lip . . . . . **1. H. obtusata.**
  Leaves 2; spur twice as long as the lip or longer . . . . . **2. H. orbiculata.**
Leaves several or numerous, always more than 2.
  Lip 3-toothed at the apex . . . . . **3. H. bracteata.**
  Lip entire.
    Leaves all at or near the base of the stem, usually withering before the opening of the flowers . . . . . **4. H. unalaschensis.**
    Leaves scattered along the stem, remaining green.
      Flowers white; lip broadened at the base . . . . . **5. H. dilatata.**
      Flowers green; lip linear.
        Spur sacklike, much shorter than the lip . . . . . **6. H. stricta.**
        Spur slender, nearly as long as the lip . . . . . **7. H. sparsiflora.**

1. Habenaria obtusata (Pursh) Richards. ONE-LEAF BOG-ORCHIS. Found only on mossy banks in wet woods along Swiftcurrent Creek just below Lake McDermott. Alaska to Colo., N. Y., and Newf. (*Lysiella obtusata* Rydb.)—Stems 10 to 20 cm. high, slender; leaf obovate, 5 to 10 cm. long, obtuse; spike loosely flowered, 2 to 5 cm. long,

the flowers greenish, 1 cm. long; lip linear-lanceolate, entire; spur slender, longer than the lip.

2. Habenaria orbiculata (Pursh) Torr. TWO-LEAF BOG-ORCHIS. Occasional on the west slope at low altitudes, in deep moist woods, the plants mostly solitary and scattered. B. C. and Wash. to Minn., N. C., and Newf. (*Lysias orbiculata* Rydb.)—Stems 30 to 50 cm. high, stout; leaves rounded or oval, 8 to 15 cm. long, rounded at the apex; flowers greenish, in a loose raceme; lip linear, 12 to 15 mm. long.

3. Habenaria bracteata (Willd.) R. Br. Wet woods at east entrance, *Umbach;* Duck Lake, *Weller.* B. C. to N. Mex., N. C., and N. B.; also in Asia. (*Coeloglossum bracteatum* Parl.)—Stems stout, 15 to 50 cm. high, very leafy; leaves oval to lanceolate, obtuse or acute, 5 to 12 cm. long; raceme dense, leafy-bracted; flowers greenish; lip 6 to 8 mm. long, the spur less than half as long.

4. Habenaria unalaschensis (Spreng.) S. Wats. WOOD-ORCHIS. Open brushy slopes or in woods, about the foot of Lake McDermott. Alaska to Calif., Colo., and Mont. (*Piperia unalaschensis* Rydb.)—Stems slender, 20 to 40 cm. high; leaves oblanceolate, 6 to 15 cm. long, the stem bracted above; flowers numerous, in a long loose spike, greenish white, 8 to 10 mm. long; lip oblong, slightly shorter than the spur.

5. Habenaria dilatata (Pursh) Hook. WHITE BOG-ORCHIS. Common at nearly all altitudes, in wet woods or thickets, in bogs, or on moist open slopes. Alaska to Calif., N. Mex., Nebr., N. Y., and Lab. (*Limnorchis dilatata* Rydb.)—Stems stout, 20 to 70 cm. high, hollow, very leafy; leaves mostly lanceolate, 6 to 20 cm. long, obtuse or acute; spikes long and dense; flowers about 1.5 cm. long, very fragrant.

A handsome plant, abundant in many places, and blooming for a long time.

6. Habenaria stricta (Lindl.) S. Wats. GREEN BOG-ORCHIS. Common at nearly all altitudes, in bogs, wet woods, or thickets, or on wet open slopes. Alaska to N. Mex. and Alta. (*Limnorchis stricta* Rydb.; *L. viridiflora* Rydb.)—Stems stout or slender, 20 to 80 cm. high; leaves mostly lanceolate or oblanceolate, 5 to 12 cm. long, obtuse or acute; spikes usually long and loose; flowers green, odorless, 12 to 14 mm. long.

7. Habenaria sparsiflora S. Wats. A few plants at Belton, in sandy thicket along river. Oreg. to Mont., N. Mex., and Calif. (*Limnorchis ensifolia* Rydb.; *L. laxiflora* Rydb.)—Stems 30 to 40 cm. high, leafy; leaves lanceolate or oblanceolate, 8 to 12 cm. long; flowers about 12 mm. long, greenish.

21. SALICACEAE. Willow Family.

Trees or shrubs; leaves alternate, entire or toothed, with stipules; flowers small, greenish, in catkins, the staminate and pistillate flowers on separate plants; sepals and petals none, represented only by a disk or by glands; fruit a capsule; seeds each with a tuft of white hairs.

Bractlets of the catkins lobed; stamens usually more than 10; leaves ovate to rounded . . . . . **1. POPULUS.**
Bractlets entire or minutely toothed; stamens usually 2, sometimes as many as 7; leaves usually narrow. . . . . **2. SALIX.**

1. POPULUS L.

Large or small trees, or sometimes shrubs; buds usually resinous; flowers appearing in early spring.

Petioles flattened; leaves about as broad as long; bark smooth . . **1. P. tremuloides.**
Petioles not flattened; leaves longer than broad; bark furrowed, at least on mature trees.
  Capsule hairy . . . . . **2. P. trichocarpa.**
  Capsule glabrous . . . . . **3. P. hastata.**

1. Populus tremuloides Michx. ASPEN. Common at low altitudes, usually forming dense pure stands. Alaska to Mex., Tenn., and Newf.—Slender small tree, or often only a shrub; bark thin, smooth, whitish or pale green; leaves slender-petioled, rounded, 2 to 5 cm. long, glabrous, pale green, finely toothed.

Known also as quaking aspen and often locally as "quaking asp." The leaves are often deformed by galls; in autumn they turn yellow. The aspen is very abundant along the automobile road on the east side of the park, often in dense stands, but it does not extend far up the slopes. In exposed places the plants are shrubby and often prostrate, probably as a result of heavy snowfall. Aspens seem to be absent about the head of Lake McDonald, but they are abundant about Belton. According to the writer's experience—and his observations have been confirmed by those of other persons—this tree is seldom found in fruit. If a cut is made in the smooth bark a scar is formed which remains throughout the life of the tree, but in Glacier Park visitors seem unaware of the possibility of leaving a permanent record of their visit upon the aspen trunks, and very few trees thus disfigured were noticed. In New Mexico the writer has often marveled at the great number of trees upon which people have cut their names or initials with dates and various designs. There, even in the most remote places, often almost every tree is thus marked, until one wonders if the whole population has conducted a concerted campaign for the purpose. Trees are often found upon which the inscriptions are 30 years old or more.

The aspen is one of the first trees to spring up on burned or cut-over areas, and it is thus important in reforestation. The reason for its rapid appearance in such places is, of course, the form of the seeds, which are scattered by the wind. The wide dissemination of the tree perhaps indicates that seeds are borne in greater profusion than casual observations would indicate. Aspen wood is useful for making paper.

2. Populus trichocarpa Torr. & Gray. BLACK COTTONWOOD. Common on the east slope, at low altitudes, usually along streams. Alaska to Calif. and Mont.—Large or small tree; bark on young trees and on younger branches smooth and resembling that of the aspen, on old trunks deeply furrowed, white, with a soft chalky appearance, in old age sometimes blackish; leaves slender-petioled, broadly ovate to lance-ovate, 6 to 12 cm. long (on sprouts often much larger), acute, finely toothed, green on the upper surface, pale beneath, usually hairy when young but soon glabrous.

3. Populus hastata Dode. WESTERN BALSAM POPLAR. Common on the west slope at low altitudes, along water or in woods. Idaho, Mont., and Alta.—Like *P. trichocarpa*, and differing only in the glabrous fruit.

It seems rather doubtful whether this is a distinct species. The writer is unable to give any information concerning the distribution and relative abundance of these two species (if they are species) in the park. It was taken for granted that only one species was represented until study of the collections in Washington revealed the presence of two. When the writer visited the park, the fruiting catkins had all fallen, but they were found, of course, under the trees. With leaf specimens alone it is impossible to determine which species is represented. Only two specimens of fruit were secured; one from the east entrance is *P. trichocarpa*, and one from Lake McDonald is *P. hastata*. Whether one species is confined to the east and one to the west slope, or whether the two grow together, it is impossible to say without further field study.

The cottonwoods are usually associated with other trees, especially aspens, but sometimes they form small pure stands. The trees on the west slope are often thickly covered with lichens. Some trees have leaves almost as narrow as those of *P. angustifolia*, and the leaves of small seedlings appear to be narrow always. Cottonwoods seem to have great vitality, and the writer noticed some logs that had been cut at least a year before which were sending out sprouts.

2. SALIX L. Willow.

(Contributed by Mr. C. R. Ball.)

Plants perennial, low and spreading to taller and erect, shrubs or small trees; bark bitter; bud scales single; leaves alternate, usually with stipules; flowers of the two sexes on different plants, in sessile or leafy-peduncled catkins, appearing before or with or after the leaves; flower scales yellow, brown, or black, entire or occasionally shallowly toothed at apex; fruit a dry, glabrous or pubescent capsule, lanceolate to lanceolate-ovoid, of 2 valves recurving at maturity; seeds minute, with a dense tuft of long silky hairs at the base; stamens usually 2 (3 to 8 in Nos. 1, 2, and 3).

Scales pale yellow, deciduous. Styles about 0.3 to 0.5 mm. long; leaves linear-lanceolate to broadly lanceolate, more than 5 cm. long.

Leaves closely and finely toothed; petioles distinct; catkins solitary; stamens 3 to 8.

Petioles glandular at upper end; capsules 6 to 9 mm. long.

Flowers in early summer; leaves green beneath . . . . . **1. S. caudata.**

Flowers in late summer; leaves white beneath . . . . . **2. S. serissima.**

Petioles never glandular; capsules 4 to 5 mm. long . . . . . **3. S. amygdaloides.**

Leaves remotely and irregularly toothed; petioles gradually merging into leaf blades; catkins often in pairs; stamens 2.

Leaves linear, light green or gray-green; teeth few to numerous, long, slender, sharp; capsules short-pediceled . . . . . **4. S. interior.**

Leaves narrowly elliptic, dark green; capsules sessile or subsessile. **5. S. melanopsis.**

Scales brownish, at least at the tip (yellow in Nos. 13, 14, and 20, but then persistent, and the leaves and capsules hairy).

Capsules glabrous. Catkins appearing with the leaves.

Leaves lanceolate or oblanceolate, acuminate, glabrous; styles about 0.5 mm. long.

Leaves glaucous beneath.

Leaves 2 to 5 cm. long; pedicels 1 mm. long . . . . . **6. S. farrae.**

Leaves mostly 5 to 7 cm. long; pedicels 2 to 4 mm. long **7. S. mackenziana.**

Leaves green beneath . . . . . **8. S. pseudomyrsinites.**

Leaves elliptic-lanceolate or oval-lanceolate to oval, acute or obtuse; styles 1 to 2 mm. long.

Leaves glabrous. Catkins nearly sessile . . . . . **9. S. pseudomonticola.**

Leaves tomentose.

Catkins on leafy peduncles; styles about 1 mm. long . . **10. S. commutata.**

Catkins sessile; styles about 2 mm. long . . . . . **11. S. barrattiana.**

Capsules hairy.

Styles elongate, 1 to 1.5 mm. long.

Leaves more or less woolly on both sides.

Plants ascending or erect, 0.2 to 2 meters high.

Styles 1.5 to 2.5 mm. long; catkins large, sessile . . . . **11. S. barrattiana.**

Styles 1 to 1.5 mm. long; catkins leafy-peduncled.

Leaves linear-oblong, 4 to 10 cm. long, white-woolly on both sides. **12. S. candida.**

Leaves elliptic or elliptic-oblong, 2 to 6 cm. long.

Catkins 1 to 1.5 cm. long; leaves and twigs yellow-woolly. **13. S. brachycarpa.**

Catkins 1.5 to 5 cm. long; leaves gray-woolly, glaucous beneath. **14. S. glaucops glabrescens.**

Plants low, creeping, alpine, less than 10 cm. high.
Leaves pale beneath . . . . . **15. S. petrophila.**
Leaves glaucous beneath . . . . . **16. S. anglorum.**
Leaves densely silvery-silky beneath. Capsules silvery-silky.
Leaves lanceolate to oblanceolate, pubescent; styles 0.8 to 1.5 mm. long; twigs often pruinose . . . . . **17. S. subcoerulea.**
Leaves obovate or obovate-oblong, tomentose; style 0.5 to 1 mm. long; twigs never pruinose . . . . . **18. S. drummondiana.**
Styles short, obsolete or only 0.2 to 0.3 mm. long.
Plants erect shrubs, mostly tall; capsules slender, 6 to 10 mm. long, on pedicels 1 to 5 mm. long.
Catkins dense, sessile or nearly so; scales black, densely silky with long hairs; stigmas long, slender . . . . . **19. S. scouleriana.**
Catkins loose, leafy-peduncled; scales yellowish, thinly hairy; stigmas very short.
Leaves elliptic-oval, strongly net-veined beneath.
Leaves more or less tomentose . . . . . **20. S. bebbiana.**
Leaves glabrate . . . . . **20a. S. bebbiana perrostrata.**
Leaves linear-oblanceolate, not net-veined beneath . . . **21. S. geyeriana.**
Plants low or creeping alpine shrubs; capsules ovate, 3 to 5 mm. long, sessile.
Plants ascending, 0.3 to 1 meter tall; leaves long-hairy beneath.
Leaves thick, broadly oval; capsules somewhat pointed . . **22. S. vestita.**
Leaves thinner, narrower; capsules blunter . . . . . **22a. S. vestita erecta.**
Plants creeping, 5 to 10 cm. tall; leaves glabrous beneath.
Leaves roundish-oval, glaucous beneath.
Blades 1.5 to 2.5 cm. long; aments usually many-flowered. **23. S. saximontana.**
Blades 7 to 12 mm. long; aments usually few-flowered . . **24. S. nivalis.**
Leaves narrowly elliptic, green beneath . . . . . **25. S. cascadensis.**

1. Salix caudata (Nutt.) Heller. Rare; at low altitudes, in wet thickets. Mountain streams from B. C. and Alta. to N. Mex. and Calif.—Stems few, 3 to 5 meters high; twigs chestnut, shining; leaves narrowly to broadly lanceolate, 6 to 13 cm. long, tapering to a long slender point; catkins stout, 1.2 to 2 cm. wide, 2 to 5 cm. long, becoming 3 to 6 cm. long in fruit; capsules thin-walled, 6 to 7 mm. long, yellowish.

2. Salix serissima (Bailey) Fernald. In cold bog about spring near Swiftcurrent Creek below Lake McDermott. East of the Divide, in southern Alta. and northern Mont. (the only other Montana specimen collected near Chouteau), eastward to northern Ohio, N. Eng., and Lower Can. — Plant similar to the last; leaves elliptic-lanceolate, acute or only short-pointed at the apex; capsules thick-walled, 7 to 9 mm. long, shining, olive-brown or darker.

Remarkable for its flowering in midsummer or later and producing fruit in late summer and autumn.

3. Salix amygdaloides Anderss. PEACHLEAF WILLOW. Belton, in thicket along the river. Along streams at low elevations, east of the Cascades from B. C. to Oreg., east to northwest Tex., central N. Y., and Que.—Tall shrub or small tree, yellowish green; twigs slender, yellowish, often drooping; petioles 1 to 2 cm. long, slender, twisted; leaves lanceolate or broadly lanceolate, 5 to 12 cm. long, long-pointed; catkins about 1 cm. wide, 3 to 5 cm. long, the pistillate becoming 4 to 7 cm. long in fruit; pedicels 2 mm. long, slender.

4. Salix interior Rowlee. SANDBAR WILLOW. East entrance, along the edge of Two Medicine Creek, at the foot of a steep shale slide. Alaska to Idaho and N. Mex., eastward to La., Del., and N. B.; not common west of the Divide, but abundant in

the Central States.—Bright green, clustered shrub, 1 to 5 meters high; twigs reddish; leaves linear or linear-lanceolate, very acute at both ends, 5 to 12 cm. long, 2 to 12 mm. wide, pure green on both sides, glabrate when mature, often thinly villous with long white hairs when young; catkins at the ends of leafy branches; capsules 5 to 8 (mostly 7) mm. long, glabrous when mature; pedicels 0.5 to 1.5 mm. long.

Forms with very narrow leaves, somewhat grayish rather than bright green, and with numerous long slender teeth, represent *S. longifolia tenerrima* Henderson, which Schneider makes a variety of *S. exigua* Nutt., but states that he is doubtful as to what specimens should be referred to this variety and what to *S. longifolia pedicellata* Anderss. They require further study.

5. Salix melanopsis Nutt. Common at low altitudes, on rocky slopes, in low thickets, or on stream and lake banks. Alta. to Idaho and west to Calif. and B. C.—Dark green clustered shrub, 1 to 5 meters high; twigs brownish; leaves oblanceolate or elliptic, acute, 4 to 8 cm. long, 6 to 15 mm. wide, usually subentire, sometimes with sharp slender teeth, deep green and glabrous above, pale green or subglaucous and often thinly hairy beneath (in the park and northward a form with leaves rather densely shining-hairy on both sides occurs rather commonly); catkins on short leafy branches; capsules glabrous, nearly sessile, 4 to 5 mm. long.

6. Salix farrae Ball. Frequent on the east slope at middle altitudes or about timber line; in bogs or wet meadows. Rocky Mts. of southern Alta. and B. C. and northern Mont.—Small shrub, probably 30 to 60 cm. high; twigs red or the youngest reddish yellow, shining; leaves oblanceolate to elliptic or broadly lanceolate, usually widest just above the middle, acute or abruptly short-acuminate at apex, 3 to 5 cm. long, entire or nearly so, glaucous and rather finely net-veined beneath at maturity; capsule 4 to 5 mm. long; pedicels 1 to 1.5 mm. long.

7. Salix mackenziana (Hook.) Barratt. Belton, on brushy rocky slope. Sask. to Wyo., Calif., and B. C.—Shrub 2 to 4 meters high; leaves oblanceolate, or the lower narrowly obovate, sometimes lanceolate, acute to short-acuminate, 4 to 7 or 10 cm. long, subentire to finely toothed; capsules 4 to 5 mm. long; pedicels 2 to 4 mm. long, 2 to 3 times as long as the scales.

8. Salix pseudomyrsinites Anderss. Frequent on the east slope at low altitudes, in wet thickets or along streams. Sask. to N. Mex., Calif., and Wash.—Shrub 1 to 3 meters high; twigs short, diverging, shining; leaves lanceolate-oblong to elliptic-lanceolate, 4 to 8 cm. long, thick, coarsely net-veined beneath, subentire to sharply gland-toothed, dark green on both sides; catkins 2 to 3 cm. long; capsules 4 to 5 mm. long; pedicels 1 to 1.5 mm. long.

9. Salix pseudomonticola Ball. Frequent on the east slope at low or middle altitudes; rarely found above timber line, on rock slides; usually in wet woods or thickets. Sask. and Alta, to northern Wyo.—Shrub 1 to 3 meters high; twigs stoutish, shining; leaves narrowly to broadly ovate (young obovate), 4 to 6 or 8 cm. long, 1.5 to 3 cm. wide, rounded to subcordate at base, acute to abruptly short-acuminate at apex, rather coarsely wavy-toothed or subentire; catkins 3 to 7 cm. long, nearly sessile; capsules 6 to 8 mm. long; pedicels 1 to 1.5 mm. long; styles about 1 mm. long.

10. Salix commutata Bebb. Common above timber line, in wet meadows or on open rocky slopes; one of the characteristic plants of alpine meadows. Alaska to northern Wyo. and Calif.—Shrub 1 to 3 meters high; twigs tomentose; leaves elliptic to broadly oblanceolate or obovate, 4 to 8 cm. long, entire or nearly so, cuspidate at apex, green and tomentose on both sides, becoming glabrate with age; catkins short, 2 to 3 or 4 cm. long, on leafy peduncles 2 to 4 cm. long; capsules 5 to 7 mm. long; pedicels about 1 mm. long.

11. Salix barrattiana Hook. Gunsight Pass, on rock slide. High elevations in the Rocky and Selkirk Mts. of Alta. and B. C.; not before collected in the U. S.—

Shrub 0.5 to 1.5 meters high; twigs stout, short, with wrinkled bark, the younger more or less gray-woolly; leaves elliptic-lanceolate, oblanceolate, or ovate-lanceolate, acute at apex, acutish to somewhat heart-shaped at base, entire or with a few glandular teeth, usually densely clothed with long gray hairs, becoming somewhat glabrate in age, 4 to 7 cm. long, 1 to 2 cm. wide; catkins stout, sessile, on old wood, 4 to 7 cm. long; capsules densely hairy, 7 to 9 mm. long, subsessile, bearing a style 1.5 to 2.5 mm. long.

The specimen collected in the park was only 30 to 60 cm. high and differs from typical material in the shorter and relatively broader, elliptic-oval leaves, 2 to 4 cm. long, and aments (one) only 4 cm. long. A similar collection has been made in the Rocky Mountain Park at Banff, Alberta.

12. Salix candida Fluegge. SAGELEAF WILLOW. In a cold bog about a spring near Swiftcurrent Creek below Lake McDermott. Alta. south to Wyo. and eastward to N. J. and Newf., in cold bogs and swamps.—Shrub 0.2 to 1 meter high; young twigs white-woolly; leaves linear to oblong or narrowly oblanceolate, the margins inrolled, entire, 3 to 8 cm. long, densely white-woolly beneath, thinly so above; catkins 1 to 3 cm. long, on short leafy peduncles; capsules subsessile, white-woolly, 6 to 8 mm. long; style reddish, 1 to 1.5 mm. long.

13. Salix brachycarpa Nutt. Occasional above timber line and in some localities abundant; on open slopes or rock slides or in wet meadows; also in an open mossy bog along Appekunny Creek. Sask. and Alta. to southern Colo., west to Utah, eastern Oreg., and B. C. (*S. stricta* Rydb.)—Alpine shrub 0.2 to 1 meter high; young twigs woolly; leaves elliptic-oblong or oblanceolate to narrowly obovate, 2 to 3.5 cm long, cutish at apex, mostly obtuse at base, yellowish green on both sides, somewhat woolly above, densely yellowish-woolly beneath, sometimes becoming glabrate, entire; catkins numerous, roundish to oblong, 0.5 to 2 cm. long; capsules ovoid-lanceolate, 5 to 7 mm. long, subsessile, woolly; styles 1 to 1.5 long.

14. Salix glaucops glabrescens Anderss. Frequent above or near timber line, in meadows, on gravelly slopes, or in moist woods; also in thicket along Swiftcurrent Creek below Lake McDermott. Yukon and Alaska south to N. Mex. and west to Utah and Idaho. (*S. glauca glabrescens* C. Schneid.; *S. pseudolapponum* Seem.)—Subalpine shrub, 0.4 to 1.5 meters high; twigs shining brown, the bark separating in gray papery flakes; leaves elliptic-lanceolate, oblanceolate, or obovate-oblong, entire, 3 to 6 cm. long, thinly gray-woolly to glabrate on both sides, glaucous beneath, often drying dark; catkins 2 to 5 cm. long, on leafy peduncles 2 to 3 cm. long; scales yellowish throughout or brownish at the tip; capsules gray-woolly, 6 to 8 mm. long; pedicel and style each about 1 mm. long.

15. Salix petrophila Rydb. Abundant above timber line, in meadows or on rocky slopes; a characteristic plant of alpine meadows, frequently forming large dense mats. Alta. and B. C., south to northern N. Mex. and west to Calif. and eastern Oreg.—Stems creeping; branches erect, 5 to 10 cm. high, glabrous; leaves broadly elliptic and acutish to narrowly obovate and often obtuse, entire, 1.5 to 4 cm. long, deep green above, pale and rather strongly veined beneath, sparingly hairy to glabrous, petioles slender, yellow; catkins 1 to 3 or 4 cm. long, on short leafy branches; capsules lanceolate, sessile, gray-woolly, 4 to 6 mm. long; style 1 to 1.5 mm. long.

16a. Salix anglorum araioclada C. Schneid. Frequent above timber line, in wet meadows or on rocky slopes. Rocky and Selkirk Mts., northern Mont. to B. C. and Alta., also eastern Que.—Plant prostrate; branches yellowish to purplish; leaves thin, papery, oval, elliptic, ovate-elliptic, or obovate-elliptic, usually obtuse at apex, entire, 2 to 5 cm. long, 1 to 3 cm. wide, usually glabrous at maturity, deep green above, glaucous beneath; catkins on leafy branches 3 to 4 cm. long, the pistillate 3 to 5 cm. long in fruit; capsule 7 to 8 mm. long, subsessile, gray-woolly; style 15 mm. long.

16b. Salix anglorum kophophylla C. Schneid. Habitat of the last, often in the highest, most exposed places. Cited by Schneider only from eastern Que. and Newf.—As the last but the leaves thicker, broadly elliptic to roundish, more strongly nerved, and more densely glaucous beneath.

17. Salix subcoerula Piper. Common on the east slope at all altitudes; along streams, in wet thickets, or on high slopes; scarce on the west slope, apparently, and noted only at Avalanche Lake. Alta. and B. C., south to N. Mex., and Calif.—Shrub 1 to 3 meters high; twigs glabrous, usually covered with a bluish powder; leaves narrowly to broadly lanceolate or oblanceolate, acute at both ends, 3 to 6 or 8 cm. long, 0.8 to 2.5 cm. wide, entire or subcrenulate, green and sparsely pubescent above, densely silvery-pubescent with short appressed shining hairs beneath; catkins sessile or nearly so, the pistillate 2 to 4 cm. long; scales brown or black; capsules 4 to 5 mm. long, subsessile or on pedicels 0.5 to 1 mm. long; style 1 to 1.5 mm. long.

18. Salix drummondiana Barratt. Frequent at low and middle altitudes, and sometimes found above timber line; in thickets or meadows, on moist slopes, or along streams. Rocky and Selkirk Mts. of Alta. and B. C. and northwestern Mont.—Shrub 1 to 3 (?) meters high; young twigs mostly pubescent or woolly, not bluish-powdery; leaves obovate, obovate-oblong, or elliptic-oblanceolate, entire, broadly acute to obtuse at apex, 3 to 6 or 8 cm. long, 1.5 to 3 cm. wide, densely silvery-woolly beneath with a thick mat of tangled hairs, thinly so above; catkins as in No. 17; capsules 5 to 6 mm. long, silvery-woolly; pedicels 0.5 to 1.5 mm. long; style 0.5 to 1 mm. long.

19. Salix scouleriana Barratt. Frequent at low and sometimes at middle altitudes, in moist woods or thickets, along streams, or on rather dry, thinly wooded hillsides; on the west slope frequently a small slender isolated tree; the only species of the park, apparently, which ever attains the dimensions of a tree. Alta. to N. Mex. and west to the coast.—Shrub or small tree, 2 to 4 meters high; twigs glabrate to densely woolly; leaves obovate to broadly oblanceolate, obtuse or mostly abruptly pointed at apex, wedge-shaped at base, entire or shallowly crenulate, dark green and glabrate above, glaucous, net-veined, and often densely tomentose beneath; catkins appearing before the leaves, sessile or nearly so, the pistillate 3 to 5 cm. long; scales obovate or oblanceolate, black, covered with long shining hairs; capsules beaked, 7 to 9 mm. long, gray-woolly; pedicels 1 to 2 mm. long; styles short; stigmas about 1 mm. long.

20. Salix bebbiana Sarg. Common at low altitudes, in swamps, along streams, or on brushy slopes. Across the continent to Alaska, N. Mex., and Calif.—A shrub or small tree, 2 to 5 meters high; leaves broadly oblanceolate to obovate-oval, entire or somewhat crenulate, 2 to 5 cm. long, 1 to 2.5 cm. wide, dull green above, paler to subglaucous and coarsely net-veined beneath, more or less gray-woolly on both sides, especially beneath; catkins appearing before or with the leaves, the staminate subsessile, 1 to 2 cm. long, yellow, the pistillate (on peduncles 0.5 to 2 cm. long) 2 to 5 cm. long, very lax in fruit; scales yellowish, oblong, 2 mm. long; capsules 6 to 10 mm. long, thinly pubescent, on slender pedicels 2 to 5 mm. long.

20a. Salix bebbiana perrostrata (Rydb.) C. Schneid. Occasional at low altitudes, in the same situations as the species. Throughout the Rocky Mts.—Differs in the smaller and thinner, elliptic or oblanceolate leaves, acute at both ends, 2 to 3.5 cm. long, glabrous or glabrate on both sides, and more finely net-veined on the lower surface.

21. Salix geyeriana Anderss. Belton, on a dry brushy slope. Mont. to Colo., west to the coast.—Shrub 1 to 3 meters high; twigs glabrous, leafy, black with a bluish powdery bloom; leaves linear-oblanceolate or narrowly elliptic, very acute at both ends, 2 to 4 or 6 cm. long, entire, dark green above, more or less glaucous beneath, thinly to densely silky-hairy on both sides; catkins on short leafy peduncles, roundish, 1 to 2 cm. long, 1 to 1.3 cm. wide; capsules 5 to 7 mm. long, pubescent, on stoutish pedicels about 2 mm. long.

22. Salix vestita Pursh. Cracker Lake and switchbacks near Swiftcurrent Pass, on rocky slopes. Alta. and B. C. to Mont. and eastern Oreg.; also Lab., Newf., Anticosti, and the Gaspé Peninsula of Que.—Ascending shrub, 0.2 to 1 meter high; leaves broadly elliptic to obovate-oblong or suborbicular, rounded to retuse at the apex, 3 to 5 or 6 cm. long, 2 to 4 cm. wide, thick, deep green and glabrous above, clothed beneath with long white silky hairs, especially on midrib and veins; catkins on short villous peduncles, slender, 2 to 3 or 4 cm. long; capsules ovoid-conic, pointed, 4 to 5 cm. long.

A very handsome shrub because of the striking contrast in the leaves between the bright green, netted upper surface and the silvery-silky under surface.

22a. Salix vestita erecta Anderss. Abundant above timber line, in meadows and on rock slides; one of the most characteristic plants of alpine situations, frequently forming large dense patches.—More erect, with narrower, more pointed leaves, longer catkins, and more ovoid-ellipsoid, blunter capsules.

23. Salix saximontana Rydb. Gunsight Pass, on rock slides and rocky slopes. Alpine summits, Alta. and B. C. to Nev. and N. Mex.—Prostrate, 3 to 6 cm. high; leaves elliptic-oblong to broadly oval, obtuse or acutish at both ends, entire, 1.5 to 3 cm. long, 1 to 2 cm. wide, glabrous on both sides; catkins several to many-flowered, 1 to 1.5 cm. long; capsules ovoid, 3 to 4 mm. long.

24. Salix nivalis Hook. Above timber line, Siyeh Pass and Boundary Peak (B. C.), 2,280 to 2,400 meters elevation, collected by Vernon Bailey, August, 1917. Alpine summits, Alta. and Mont. and westward.—Scarcely 2 cm. high; leaves as the last but only 7 to 12 mm. long and 4 to 8 mm. wide; catkins few-flowered, less than 1 cm. long; capsules 2.5 to 3 mm. long.

25. Salix cascadensis Cockerell. Sexton Glacier, abundant on rocky slope. Alpine summits, Wyo. and Mont. to Wash. (*S. tenera* Anderss.)—Prostrate, creeping, 3 to 5 cm. high; leaves narrowly elliptic to subobovate, mostly acute at both ends, deep green and shining on both sides, glabrous, strongly veined, 8 to 15 mm. long, 4 to 8 mm. wide; catkins subglobose, 5 to 20-flowered, 7 to 20 mm. long; capsules sessile, 4 to 5 mm. long, gray-tomentose.

22. BETULACEAE. Birch Family.

Trees or shrubs; leaves alternate, toothed or somewhat lobed; flowers staminate and pistillate, the staminate ones in slender drooping catkins; pistillate flowers in short catkins, these becoming conelike, inclosing the small nutlike or seedlike fruits.

Conelike pistillate catkins falling apart when mature, their bracts 3-lobed. **1. BETULA.**

Conelike pistillate catkins not falling apart, their bracts not lobed . . . **2. ALNUS.**

1. BETULA L. Birch.

Trees or shrubs; leaves stalked, small or large; fruit narrowly or broadly winged.

Leaves 1 to 2.5 cm. long, rounded at the tip, the teeth rounded . . **1. B. glandulosa.**

Leaves mostly 3 to 10 cm. long, usually sharp-pointed, the teeth sharp.

Bark not separating into layers; twigs densely covered with glands, not hairy; leaves mostly less than 5 cm. long . . . . . **2. B. fontinalis.**

Bark separating into thin layers; twigs hairy and often glandular; leaves mostly 5 to 10 cm. long.

Bark white or yellowish white; twigs usually not glandular . . **3. B. papyrifera.**

Bark reddish brown; twigs glandular . . . . . **4. B. occidentalis.**

1. Betula glandulosa Michx. Scrub birch. Frequent on the east slope at nearly all altitudes, in bogs, along streams, or on alpine slopes. Alaska to Colo., Minn., Me., and Greenl.—Shrub, usually 1 to 2 meters high, with reddish brown, very glandular branchlets; leaves rounded, short-stalked, glabrous; cones 1 to 2 cm. long, the fruit with a narrow wing.

The shrub is abundant in some places, but the stations are scattered and often isolated. Above timber line the plants are sometimes spreading and only 30 to 60 cm. high.

2. Betula fontinalis Sarg. WATER BIRCH. Along creek near St. Mary, and probably elsewhere. Yukon to Utah, N. Mex., and Nebr.—Shrub or small tree with very sticky twigs, the bark reddish brown; leaves broadly ovate, rounded or somewhat cordate at the base, nearly glabrous, coarsely toothed; cones 2 to 3 cm. long, the fruit broadly winged.

Most of the plants of St. Mary are only 1 to 1.5 meters high.

3. Betula papyrifera Marsh. CANOE BIRCH. Common on the west slope at low and middle altitudes, along streams or lake shores, or often on rocky hillsides. Alaska to Colo., N. J., and Lab.—Small or large tree with chalky white or, on young trees, yellowish white bark; leaves broadly ovate, 4 to 10 cm. long, slender-stalked, obtuse to subcordate at base, long or short-pointed, finely hairy beneath or nearly glabrous; cones 2 to 4 cm. long; fruit very broadly winged.

Many of the trees about Lake McDonald are very large; they are often densely covered with lichens. The bark of this species was formerly much used by the Indians for making canoes. The wood is often employed in the manufacture of paper. The canoe birch is a very handsome tree, its white bark contrasting strongly with that of other trees with which it is associated. It is said to grow in a few places on the east slope of the park, but this is doubtful.

4. Betula occidentalis Hook. WESTERN BIRCH. Occasional on the east slope at low altitudes. B. C. and Wash. to Mont.—Small or medium-sized tree with finely hairy twigs; leaves thin, broadly ovate, 4 to 10 cm. long, somewhat hairy beneath, long-pointed; cones 3 to 4 cm. long.

2. ALNUS Hill. ALDER.

Shrubs or small trees with smooth, close, reddish brown bark; leaves slender-stalked; fruit with or without a wing.

Fruit winged; twigs with resin dots, not hairy . . . . . **1. A. sinuata.**
Fruit not winged; twigs not resinous, finely hairy . . . . . **2. A. tenuifolia.**

1. Alnus sinuata (Regel) Rydb. GREEN ALDER. Common at high and middle altitudes, and occasionally, especially on the west slope, at low altitudes; along streams or lake shores, in moist woods, or on open slopes. Alaska to Oreg., Wyo., and Alta.—Shrub, 1 to 2 meters high, or sometimes a small tree; leaves broadly ovate, 4 to 10 cm. long, bright green, acute or obtuse, thin, closely and sharply toothed, scarcely at all lobed, nearly glabrous, but with tufts of hairs beneath in the axils of the veins; cones 1 to 1.5 cm. long.

This species often forms extensive, dense, nearly impenetrable thickets on slopes at middle or high elevations. The stems are usually bent down, probably as a result of the weight of overlying snow. It is only at low altitudes that this alder gets to be a small tree.

2. Alnus tenuifolia Nutt. MOUNTAIN ALDER. Common at low altitudes, along streams or in wet places. Alaska to Calif., N. Mex., and Mont.—Shrub, 1 to 4 meters high; leaves oval or broadly ovate, 4 to 10 cm. long, thick, rather dull green, shallowly lobed and with broad teeth, somewhat hairy beneath; cones 1 to 2 cm. long.

This species nearly always grows at lower altitudes than *A. sinuata*, but sometimes the two are found together. The Blackfoot Indians employed the tough bark for making stirrups, which were covered with rawhide. They also used a hot decoction of the bark as drink for the treatment of scrofula. Their name for the plant is "red mouth bush," in allusion to the fact that when the bark is chewed the saliva is colored red.

23. URTICACEAE. Nettle Family.

1. URTICA L. Nettle.

Perennials, with stinging hairs; leaves opposite, stalked, toothed, with stipules; flowers very small, green, in panicles in the axils of the leaves; sepals 4; petals none; fruit a small green achene.

Stems densely bristly; petioles usually shorter than the breadth of the leaves. **1. U. dioica.**

Stems with few scattered bristles; petioles usually longer than the breadth of the leaves . . . . . **2. U. lyallii.**

1. Urtica dioica L. Open slopes at east entrance and Belton. Native of Eur.; naturalized in N. Amer.—Stems 30 to 80 cm. high, stout; leaves ovate or heart-shaped, 3 to 10 cm. long, coarsely toothed.

2. Urtica lyallii S. Wats. Common at low and middle altitudes, in moist woods or thickets; sometimes found above timber line. Alaska to Wash., Wyo., Conn., and Newf. (*U. cardiophylla* Rydb.; *U. viridis* Rydb.)—Stems slender, 0.5 to 1.5 meters high, nearly glabrous except for the bristles; leaves lance-oblong to ovate or heart-shaped, 5 to 15 cm. long, thin, coarsely toothed.

The hairs sting the skin very painfully, and their effects sometimes last for several days.

24. SANTALACEAE. Sandalwood Family.

1. COMANDRA Nutt.

1. Comandra pallida A. DC. Bastard toadflax. Common on open rocky slopes or on prairie at low and middle altitudes. B. C. to Man., Ariz., and Tex.—Glabrous perennial, 10 to 30 cm. high; leaves small, alternate, sessile, glaucous, entire; flowers small, white, in cymes; calyx 5-lobed; corolla none; fruit drupelike.

25. POLYGONACEAE. Buckwheat Family.

Annual or perennial herbs with alternate leaves (leaves mostly at the base of the stem in some groups); flowers small, with 3 to 6 sepals and no petals; stamens 4 to 8; fruit small, dry, 1-seeded, 3-angled or flattened.

Leaves without stipules; flowers in small clusters, each cluster surrounded by a calyx-like involucre of united bracts; stamens 9 . . . . . **1. ERIOGONUM.**

Leaves with sheathing stipules; flowers not in clusters surrounded by involucres; stamens 4 to 8.

Sepals 5; stigmas not brushlike . . . . . **2. POLYGONUM.**

Sepals 4 or 6; stigmas brushlike.

Sepals 6; fruit 3-angled; leaves not kidney-shaped . . . . . **3. RUMEX.**

Sepals 4; fruit flattened; leaves mostly kidney-shaped . . . . . **4. OXYRIA.**

1. ERIOGONUM Michx.

Perennials; leaves entire, basal, the stem sometimes bearing a whorl of leaves below the flowers; flowers small, surrounded by an involucre of united bracts, the involucres in heads or umbels.

Sepals hairy, at least at the base.

Flowers bright yellow; stems 10 to 30 cm. high; sepals hairy almost all over. **1. E. piperi.**

Flowers yellowish white; stems 2 to 10 cm. high; sepals hairy only at the base. **2. E. androsaceum.**

Sepals not hairy.

Involucres in umbels; leaves green on the upper side . . . . . **3. E. subalpinum.**

Involucres in one head; leaves densely and closely white-woolly on both sides. **4. E. depressum.**

1. Eriogonum piperi Greene. SULPHUR-PLANT. Common at nearly all altitudes on the east slope, on open rocky hillsides; abundant on rock slides above timber line. Wash. to Wyo. and Mont.—Plants usually forming dense clumps; leaves oblanceolate, stalked, obtuse, 3 to 10 cm. long, densely woolly beneath, green and thinly silky on the upper surface; involucres in a large umbel; sepals about 5 mm. long, often becoming deep red in age.

It is doubtful whether this is more than a mere form of *E. flavum* Nutt.

2. Eriogonum androsaceum Benth. On rock slides and exposed summits above timber line, rare in most places; occasionally found in exposed places at low altitudes. B. C., Alta., and Mont.—Often forming dense mats; leaves oblanceolate or spatulate, 1 to 2 cm. long, densely woolly or becoming green on the upper surface; involucres in a small umbel; flowers 4 to 5 mm. long, sometimes tinged with pink.

3. Eriogonum subalpinum Greene. UMBRELLA-PLANT. Common on the east slope at nearly all altitudes, on open hillsides or in meadows. B. C. to Nev., Colo., and Alta.—Plants 15 to 40 cm. high, usually forming loose patches; leaves elliptic, ovate, or obovate, 1.5 to 5 cm. long, green on the upper side and glabrous or nearly so, densely white-woolly beneath; flowers greenish white or tinged with pink, 4 to 5 mm. long.

4. Eriogonum depressum (Blankinship) Rydb. SILVER-PLANT. Common on the east slope at high and middle altitudes, on rock slides or open rocky hillsides. Oreg. to Mont.—Plants 5 to 15 cm. high, usually forming small dense mats; leaves rounded or broadly ovate, 5 to 15 cm. long, white, long-stalked; flowers 3 to 4 mm. long, yellowish white, often tinged with pink.

The name "silver-plant" was applied to this and related species by prospectors because the plant was believed to indicate the presence of silver deposits.

2. POLYGONUM L.

Annuals or perennials, sometimes growing in water; leaves alternate, entire; flowers solitary or clustered in the axils of the leaves or in spikes.

Stems climbing; leaves triangular, with lobes at the base . . . . . **1. P. convolvulus.**
Stems not climbing; leaves never triangular.
  Flowers in dense spikes, not bracted, white or deep pink.
    Flowers deep pink; stems very leafy, often branched and bearing several spikes.
      Leaves acute, with fine appressed hairs . . . . . **2. P. muhlenbergii.**
      Leaves obtuse, glabrous . . . . . **3. P. amphibium.**
    Flowers white; stems with small leaves, not branched.
      Spikes 10 to 15 mm. thick, without bulblets . . . . . **4. P. bistortoides.**
      Spikes 5 to 6 mm. thick, bearing bulblets below . . . . . **5. P. viviparum.**
  Flowers mostly in the axils of the leaves, sometimes in spikes but then with leaflike bracts at the base of the flowers, greenish.
    Flowers bent downward in fruit.
      Lower leaves oval or rounded . . . . . **6. P. austinae.**
      Lower leaves linear or lanceolate.
        Flowers 1.5 to 2 mm. long; leaves all linear . . . . . **7. P. engelmannii.**
        Flowers 3 to 4 mm. long; leaves linear or more often lanceolate. **8. P. douglasii.**
    Flowers erect, never bent downward.
      Flowers crowded near the ends of the stems, the inflorescence spikelike; bracts with broad white margins . . . . . **9. P. polygaloides.**
      Flowers solitary or clustered in the axils of the leaves; bracts without white margins.
        Stems red, slender, wiry, not ridged . . . . . **10. P. minimum.**
        Stems pale green, stout, ridged.
          Stems usually prostrate; sepals with white or pink edges. **11. P. aviculare.**

Stems erect; sepals with yellowish green edges.
Leaves oval or rounded, the upper ones not reduced . **12. P. achoreum.**
Leaves oblong, the upper ones smaller than the lower ones.
13. P. ramosissimum.

1. Polygonum convolvulus L. WILD BUCKWHEAT. Occasional at low altitudes, in waste ground or on open slopes. Native of Eur.; widely naturalized in N. Amer. (*Bilderdykia convolvulus* Dum.)—Slender glabrous annual; leaves 2 to 6 cm. long, slender-stalked, acute; flowers greenish white, in short loose racemes.

2. Polygonum muhlenbergii(Meisn.) S. Wats. WATER SMARTWEED. East entrance, about ponds on prairie. B. C. to Calif., Va., and Me. (*Persicaria muhlenbergii* Small.)—Stout perennial, 30 to 70 cm. high, the stems rooting below; leaves lanceolate, stalked, 5 to 15 cm. long; spikes 3 to 8 cm. long.

3. Polygonum amphibium L. Collected in lake near Belton by Umbach. Alaska to Calif., N. J., and Que. (*Persicaria coccinea* Greene.)—Usually floating in water; leaves oblong, slender-stalked, 3 to 10 cm. long; spikes 1 to 3 cm. long.

4. Polygonum bistortoides Pursh. BISTORT. Common in moist meadows above timber line, rarely found in moist places at lower altitudes. B. C. to Calif., N. Mex., and Mont. (*Bistorta bistortoides* Small.)—Perennial with thick rootstocks, 15 to 40 cm. high, glabrous; basal leaves long-stalked, oblong, 6 to 15 cm. long, pale on the lower surface; spikes 1 to 5 cm. long; stamens projecting beyong the sepals.

The flowers are showy but they do not last long. The plants usually grow among grasses and sedges. The Blackfoot Indians used the roots in soups and stews.

5. Polygonum viviparum L. ALPINE BISTORT. PLATE 49, A. Frequent above timber line, in meadows and on rock slides; occasionally found in moist places at middle altitudes. Alaska to N. Mex., N. H., and Greenl.; also in Eur. and Asia. (*Bistorta vivipara* S. F. Gray.)—Plants glabrous, 10 to 15 cm. high; basal leaves oblong, slender-stalked, 2 to 8 cm. long, obtuse; spikes 2 to 7 cm. long, the lower flowers replaced by small green bulblets.

6. Polygonum austinae Greene. East entrance, in gravel along creek. Alta. to Wyo. and Calif.—Annual, 5 to 15 cm. high, slender, branched from the base; leaves 5 to 15 mm. long, bright green; flowers green, mostly in the axils of the leaves; bracts very small.

7. Polygonum engelmannii Greene. Dry brushy hillside near Sun Camp. B. C. to Colo.—Erect annual, 5 to 30 cm. high, densely branched from the base, very slender; leaves 5 to 20 mm. long, the upper ones very small; sepals green, with whitish edges.

8. Polygonum douglasii Greene. Frequent at low and middle altitudes, in woods or on open or brushy slopes. B. C. to Calif., N. Mex., N. Y., and Vt.—Erect annual, 15 to 40 cm. high, slender; leaves 2 to 5 cm. long; sepals green, with white or pink edges.

9. Polygonum polygaloides Meisn. Frequent on the east slope at low altitudes, on dry open hillsides. Wash. and Oreg. to Wyo. and Mont.—Erect annual, 4 to 12 cm. high, very slender; leaves linear, 1 to 2 cm. long; flowers 2 mm. long, white or pinkish.

10. Polygonum minimum S. Wats. Frequent at middle altitudes and sometimes above timber line, on open slopes or in woods or thickets. B. C. to Calif., Colo., and Mont.—Slender annual, 3 to 15 cm. high, usually branched, very leafy; leaves oval or obovate, 5 to 15 mm. long, bright green; flowers 1.5 to 2 mm. long, the sepals green, with pinkish edges.

11. Polygonum aviculare L. KNOTWEED. Common at low altitudes, on dry slopes or on prairie; often extending well up along the trails. Native of Eur. and Asia; widely naturalized in N. Amer. —Plants bluish green, much branched, usually prostrate but sometimes erect when young or when growing among other plants; leaves oblong or lanceolate, 5 to 25 mm. long, obtuse; flowers 2 to 3 mm. long.

Plants found about dried-up ponds near the east entrance are noteworthy because of their very narrow, appressed leaves.

12. Polygonum achoreum Blake. Occasional about St. Mary and the east entrance, on dry open slopes or along roadsides. Mont. to Que.—Plants 15 to 30 cm. high, branched, glabrous; leaves 1 to 2 cm. long, rounded at the apex; flowers 3 mm. long.

13. Polygonum ramosissimum Michx. TALL KNOTWEED. Along the railroad near Belton; probably introduced. B. C. to Nev., N. Mex., and Ill.—Annual, 20 to 50 cm. high, branched, glabrous, yellowish green; leaves 1 to 3 cm. long; flowers 3 mm. long.

3. RUMEX L. DOCK.

Perennials or annuals, usually with thick roots or with rootstocks; leaves alternate; flowers small, the staminate and pistillate ones sometimes on different plants; sepals 6, the 3 inner ones sometimes with a seedlike tubercle on the back.

Inner sepals deeply toothed or lobed.
  Lower leaves notched at the base, broadly ovate; only one of the inner sepals with a tubercle; stems usually unbranched . . . . . **1. R. obtusifolius.**
  Lower leaves narrowed at the base, lanceolate; all the inner sepals with tubercles; stems much branched . . . . . **2. R. maritimus.**
Inner sepals not toothed or lobed, or very minutely toothed.
Inner sepals each with a tubercle on the back.
  Leaves dark green, wavy or ruffled; inner sepals minutely toothed in fruit. **3. R. crispus.**
  Leaves pale green, flat; inner sepals entire . . . . . **4. R. mexicanus.**
Inner sepals without tubercles.
  Sepals in fruit 5 to 6 mm. wide; leaves without acid flavor; flowers all perfect. **5. R. occidentalis.**
  Sepals 3 mm. wide or less; leaves with acid flavor; staminate and pistillate flowers on separate plants.
    Leaves narrowed at the base, without lobes or auricles . . . **6. R. paucifolius.**
    Leaves with auricles or lobes at the base.
      Sepals not enlarged in fruit, the fruit projecting beyond them. **7. R. acetosella.**
      Sepals enlarged in fruit, much longer than the fruit . . . . . **8. R. acetosa.**

1. Rumex obtusifolius L. BITTER DOCK. A few plants near the chalets at St. Mary. Native of Eur.; widely naturalized in N. Amer.—Plants 0.5 to 1 meter high, with thick roots; basal leaves 15 to 30 cm. long; sepals green, in fruit 5 mm. long, lobed about half way to the base, one of them with a tubercle.

2. Rumex maritimus L. GOLDEN DOCK. East entrance, about dried-up pools on prairie; scarce. B. C. to Calif., N. C., and N. B.; also in Eur. and Asia.—Annual, 30 to 60 cm. high, finely hairy or nearly glabrous; leaves 3 to 15 cm. long, stalked; sepals green, about 2 mm. long, lobed nearly to the base, with 1 to 3 bristle-like lobes.

3. Rumex crispus L. YELLOW DOCK. Rather rare, in thickets or waste ground at low altitudes, sometimes extending high up along trails. Native of Eur.; widely naturalized in N. Amer.—Perennial, 30 to 60 cm. high, with thick yellow roots; leaves oblong or lanceolate, 15 to 30 cm. long, cordate to acute at base; sepals green, 3 to 5 mm. long.

The leaves are often cooked and eaten as "greens."

4. Rumex mexicanus Meisn. PALE DOCK. Frequent at low altitudes, in wet open ground or thickets. B. C. to Mex., Mo., and Lab.—Glabrous perennial, 30 to 70 cm. high, usually branched and often forming dense clumps; leaves lanceolate, 5 to 15 cm. long, acute at the base; sepals green, about 5 mm. long.

5. Rumex occidentalis S. Wats. MOUNTAIN DOCK. Occasional on the east slope at low altitudes, in bogs or wet thickets. Alaska to Calif., N. Mex., N. Dak., and Lab.—Glabrous perennial, 0.5 to 1 meter high, with simple stems; leaves oblong-lanceolate, 10 to 30 cm. long, usually cordate at base; flowers in a narrow dense panicle; sepals reddish or purplish in fruit.

6. Rumex paucifolius Nutt. Collected at east entrance by Umbach. B. C. to Calif., Colo., and Alta.—Glabrous perennial, 20 to 50 cm. high, with simple stems; leaves lanceolate or oblanceolate, 3 to 10 cm. long; flowers usually tinged with red.

7. Rumex acetosella L. SHEEP SORREL. Common at low altitudes, in open places or in woods; often extending high up along the trails. Native of Eur.; widely naturalized in N. Amer.—Perennial, 10 to 60 cm. high, with creeping rootstocks, often much branched from the base, slender; leaves 3 to 10 cm. long, most of them with 2 spreading lobes at the base; flowers about 1 mm. long, usually deep red or purplish.

In some places very abundant and forming dense patches.

8. Rumex acetosa L. SOUR DOCK. Frequent above timber line on rock slides; sometimes in wet meadows at low and middle altitudes. Alaska to Mont.; also in Eur., and naturalized in eastern N. Amer.—Glabrous perennial, 0.2 to 1 meter high, with short rootstocks; leaves oblong or ovate, 3 to 10 cm. long, usually cordate at the base, the stem leaves clasping; sepals tinged with red.

In many books the statement is made that this species is wholly adventive in North America, but it is certainly native in Montana, and doubtless also in Alaska and western Canada.

4. OXYRIA Hill.

1. Oxyria digyna (L.) Hill. MOUNTAIN SORREL. Abundant above timber line, on slopes or rock slides; occasionally found at middle elevations, and scattered plants occur about the east entrance. Alaska to Calif., N. Mex., Alta., N. H., and Greenl.; also in Eur. and Asia.—Perennial, 5 to 30 cm. high, often forming dense clumps; leaves mostly at base of stem, long-stalked, kidney-shaped, 1 to 3 cm. broad; flowers panicled, green tinged with red, the 4 sepals 4 to 6 mm. wide.

A characteristic plant of alpine rock slides, conspicuous because of the red coloring of the flowers. The succulent leaves have a pleasant acid flavor; they can be used in salads and sandwiches. Ptarmigan are fond of the flowers, and many of the plants are cropped by animals, presumably sheep and goats.

26. CHENOPODIACEAE. Goosefoot Family.

Annual herbs with succulent leaves; flowers small, greenish, the calyx of 2 to 5 sepals; corolla none; fruit small, 1-seeded.

Leaves, at least the lower ones, opposite; fruit inclosed by 2 green bracts. **1. ATRIPLEX.**

Leaves all alternate; fruit not inclosed by bracts.

Leaves linear, never white-mealy or toothed.

Leaves with spiny tips; calyx winged in fruit . . . . . **2. SALSOLA.**

Leaves never with spiny tips; calyx not winged . . . . . **3. DONDIA.**

Leaves much broader than linear or, if narrow, white-mealy, often toothed.

Sepal 1 . . . . . **4. MONOLEPIS.**

Sepals 3 to 5 . . . . . **5. CHENOPODIUM.**

1. ATRIPLEX L.

1. Atriplex hastata L. A few plants found in low alkaline spots on prairie at the east entrance. Widely distributed in N. Amer., Eur., and Asia.—Annual, 10 to 50 cm. high, with scurfy pubescence; leaves triangular, fleshy, 2 to 6 cm. long, toothed; flowers very small, green, in spikes.

The plants found by the writer were depauperate, and only 5 to 15 cm. high.

2. SALSOLA L.

1. Salsola pestifer A. Nels. RUSSIAN THISTLE. A few plants in waste ground about Belton and the east entrance. Native of Eur.; introduced as a weed in N. Amer.—Annual, 30 to 60 cm. high, usually forming dense bushy clumps; leaves linear, 2 to 5 cm. long, spine-tipped, glabrous; flowers small, green, in the leaf axils; calyx winged in fruit.

In many parts of the West this is an abundant and troublesome weed. In the plains region of Montana it is very common, and east of the park one sees many fields so densely covered with the Russian thistle that they appear to have been deliberately seeded with the plant. In autumn and winter when the plants are dead they are rolled about by the wind as "tumbleweeds," and it is thus that the seeds are scattered so efficiently. The dry plants are often lodged in great masses along wire fences.

3. DONDIA Adans.

1. Dondia depressa (Pursh) Britton. Abundant at east entrance in low alkaline places on prairie. Sask. to Nev., N. Mex., and Kans. (*D. erecta* A. Nels.; *Suaeda depressa* S. Wats.)—Glabrous annual, erect or spreading, very fleshy; leaves linear, alternate, 1 to 2 cm. long; flowers green, borne in the leaf axils.

The plants are usually purplish red, and form dense carpets.

4. MONOLEPIS Schrad.

1. Monolepis nuttalliana (Schult.) Greene. POVERTY-WEED. Occasional on the east slope at low altitudes, on open hillsides or in thickets. Wash. to Calif., Tex., and Minn.—Annual, 10 to 30 cm. high, branched from the base, nearly glabrous; leaves alternate, 1 to 4 cm. long, lobed and often toothed; flowers in small clusters in the leaf axils.

5. CHENOPODIUM L.

Annuals, with mealy or glandular pubescence; leaves alternate, entire, toothed, or lobed; flowers very small, greenish, in spikes or dense clusters; sepals 3 to 5.

Leaves deeply lobed, finely glandular-hairy, sweet-scented . . . . . **1. C. botrys.**
Leaves entire or toothed, neither glandular-hairy nor sweet-scented.
Seed standing erect inside the calyx.
Leaves white-mealy beneath; calyx green, not fleshy . . . . . **2. C. salinum.**
Leaves green, not mealy; calyx becoming red and fleshy.
Plants low, spreading, very fleshy; flowers in short spikes in the axils of the leaves . . . . . **3. C. humile.**
Plants tall (30 to 60 cm.), erect, not very fleshy; flowers in rounded clusters in the axils of the leaves . . . . . **4. C. capitatum.**
Seed lying crosswise in the calyx.
Pericarp (outer coat of the fruit) easily separating from the shining seed.
Leaves linear or narrowly lanceolate . . . . . **5. C. leptophyllum.**
Leaves rhombic-ovate . . . . . **6. C. atrovirens.**
Pericarp not separating from the seed.
Clayx closed over the fruit at maturity . . . . . **7. C. album.**
Calyx open and exposing the fruit . . . . . **8. C. hians.**

1. Chenopodium botrys L. JERUSALEM OAK. Occasional along railroad at Belton. Native of Eur.; adventive in N. Amer.—Plants 10 to 40 cm. high, branched, finely viscid-hairy; leaves 1 to 5 cm. long; flowers in loose axillary clusters.

2. Chenopodium salinum Standl. Frequent about east entrance, on open slopes or about dried-up pools on prairie. Oreg. to N. Mex. and Nebr.—Plants usually prostrate, much branched; leaves oblong to broadly ovate, 1 to 3 cm. long, toothed; flowers in short spikes in the axils of the leaves.

Doubtfully distinct from *C. glaucum* L., of the Old World.

3. Chenopodium humile Hook. ALKALI BLITE. East entrance, in low alkaline places. B. C. to Calif., Colo., and Nebr.—Plants much branched, often conspicuously tinged with red; leaves mostly obovate or spatulate, 1 to 3 cm. long.

4. Chenopodium capitatum (L.) Aschers. STRAWBERRY BLITE. East slope at low altitudes, rare and perhaps introduced. Widely distributed in N. Amer. and in Eur. and Asia. (*Blitum capitatum* L.)—Plants pale green, glabrous, simple or branched; leaves triangular to lanceolate, 3 to 6 cm. long, toothed; flower clusters in fruit fleshy and bright red, suggesting strawberries.

5. Chenopodium leptophyllum Nutt. Open slopes or low places at east entrance. B. C. to Oreg., N. Mex., and Mo.; also on the Atlantic coast.—Plants erect, branched, 30 to 70 cm. high, white-mealy; leaves short-petioled, 1 to 5 cm. long, entire or with a few teeth; flowers in panicled spikes.

6. Chenopodium atrovirens Rydb. East entrance, on dry banks. Mont. to Nev.—Plants erect, green, 20 to 50 cm. high; leaves rhombic-ovate, long-petioled, 1 to 3 cm. long, toothed.

7. Chenopodium album L. LAMB'S-QUARTERS. Frequent at low altitudes, in waste or cultivated ground or on open or brushy slopes; often extending high up along the trails. Native of Eur.; widely naturalized as a weed in N. Amer.—Plants branched, 0.5 to 1 meter high, usually white-mealy, sometimes green; leaves lanceolate to rhombic-ovate, 2 to 6 cm. long, coarsely toothed, slender-petioled.

Some of the specimens are very green and might be referred to *C. payanum* Reichenb., but that is probably only a form of *C. album*.

8. Chenopodium hians Standl. Along trail at head of Lake McDonald. Mont. to N. Mex.—Plants 20 to 60 cm. high, white-mealy; leaves oblong to rhombic-ovate, 1 to 3 cm. long, entire or toothed, short-petioled.

27. AMARANTHACEAE. Pigweed Family.

1. AMARANTHUS L.

Annuals; leaves alternate, entire; flowers very small, green, in panicled spikes or in clusters in the axils of the leaves; sepals 3 to 5; petals none; flowers each with 3 spine-pointed bracts at the base; fruit small, 1-seeded, dry, inclosed in the calyx.

Flowers in long dense spikes at the top of the plant . . . . . **1. A. retroflexus.**
Flowers in small dense clusters in the axils of the leaves.
  Plants erect; bracts much longer than the sepals; seeds about 0.8 mm. broad. **2. A. graecizans.**
  Plants prostrate; bracts only slightly longer than the sepals; seeds about 1.5 mm. broad . . . . . **3. A. blitoides.**

1. Amaranthus retroflexus L. PIGWEED. A few plants along the railroad at Belton; introduced. Widely distributed in the U. S. and southern Can.—Plants erect, 0.3 to 1 meter high or often larger, somewhat hairy; leaves ovate, 3 to 10 cm. long, slender-petioled, obtuse.

2. Amaranthus graecizans L. TUMBLEWEED. Waste or cultivated ground, Belton and east entrance; infrequent. Widely distributed in N. Amer. and Eur.—Plants much branched, 20 to 60 cm. high, the stems pale; leaves mostly spatulate, 1 to 4 cm. long.

3. Amaranthus blitoides S. Wats. Waste or cultivated ground, Belton and east entrance; infrequent. B. C. to Calif., Tex., and Minn.—Stems stout, glabrous or nearly so, much branched, forming circular mats; leaves mostly spatulate, 1 to 3 cm. long.

28. PORTULACACEAE. Purslane Family.

Plants succulent, annual or perennial; leaves entire, opposite or alternate; sepals 2; petals 4 or 5 or sometimes more; stamens as many as the petals; fruit a small capsule.

Stem with 2 small opposite linear bractlike leaves; capsule opening around the base, the top coming off like a cap; petals 6 to 8 . . . . . **1. OREOBROMA.**
Stem with numerous leaves, or with 2 broad leaves; capsule opening at the top by 3 valves; petals 5 . . . . . **2. CLAYTONIA.**

1. OREOBROMA Howell.

1. Oreobroma pygmaea (A. Gray) Howell. BREADROOT. East entrance, on creek bank, *Umbach*. Wash. to Calif., Colo., and Mont.—Stems 2 to 5 cm. high, clustered, from a thick fleshy root, 1-flowered; leaves linear, 2 to 7 cm. long; petals pink or white, 8 to 10 mm. long.

2. CLAYTONIA L. SPRINGBEAUTY.

Glabrous annuals or perennials; leaves opposite or alternate; flowers in racemes.

Stem leaves 2, opposite.
Plants with long thick taproots; basal leaves numerous, obtuse . **1. C. megarrhiza.**
Plants with rounded tuber-like roots; basal leaf 1, acute . . . . . **2. C. lanceolata.**
Stem leaves numerous, alternate.
Leaves spatulate; plants perennial . . . . . **3. C. parvifolia.**
Leaves linear; plants annual . . . . . **4. C. linearis.**

1. Claytonia megarrhiza (A. Gray) Parry. ALPINE SPRINGBEAUTY. Frequent above timber line, on high rock slides and rocky slopes. Wash. to Mont. and N. Mex.—Stems 3 to 10 cm. long, in a dense tuft; basal leaves spatulate or rounded, 1 to 3 cm. long, on very long broad petioles; petals 6 to 8 mm. long, pink or white.

The leaves and stems are usually tinged with red. The roots are very elastic.

2. Claytonia lanceolata Pursh. Frequent in meadows above timber line; also in aspen thickets at east entrance. B. C. to Calif., N. Mex., and Sask.—Stems 5 to 20 cm. high; stem leaves lanceolate or ovate-oblong, 2 to 5 cm. long, sessile; petals white or pink, 6 to 8 mm. long.

The plants bloom only a short time and are not conspicuous. The tuberous roots were dug in the spring by the Blackfoot Indians, boiled, and eaten.

3. Claytonia parvifolia Moc. PINK SPRINGBEAUTY. Frequent at low and middle altitudes, extending up to timber line, in moist woods or thickets or along brooks. Alaska to Calif. and Mont. (*Naiocrene parvifolia* Rydb.)—Stems slender, 10 to 30 cm. long, ascending; leaves 5 to 20 mm. long, the lower ones petioled; petals pink, 8 to 10 mm. long, notched.

The plants produce small green bulblets in the leaf axils.

4. Claytonia linearis Dougl. Occasional on the east slope at low altitudes, in moist thickets or on open hillsides. B. C. to Calif. and Mont. (*Montiastrum lineare* Rydb.)—Stems slender, 5 to 25 cm. high, branched; leaves 1 to 5 mm. long; seeds black and shining.

The flowers are seen only in spring.

29. SILENACEAE. Pink Family.

Annual or perennial herbs with opposite entire leaves; flowers most often in cymes; sepals 4 or 5, distinct or united; petals 4 or 5, sometimes wanting; fruit a capsule, containing few or many seeds.—The name Caryophyllaceae is often used for the family. The cultivated pinks and carnations belong to the group.

Sepals united; petals clawed.
Styles 5; capsule with 10 teeth . . . . . **1. LYCHNIS.**
Styles 3; capsule with 6 teeth . . . . . **2. SILENE.**
Sepals distinct; petals not clawed.
Petals deeply 2-lobed; capsule with twice as many valves or teeth as styles.
Capsule long, cylindric, often curved, opening with 10 teeth at the apex; styles 5. **3. CERASTIUM.**

Capsule short, ovoid or oblong, not curved, usually opening with 6 valves; styles usually 3 . . . . . **4. STELLARIA.**

Petals entire or shallowly notched, sometimes none; capsule with as many (entire or 2-cleft) valves as styles.

Styles as many as the sepals and alternate with them; petals shorter than the sepals . . . . . **5. SAGINA.**

Styles fewer than the sepals or, if of the same number, opposite them; petals usually much longer than the sepals.

Seeds with a small appendage; flowers mostly in the axils of the leaves; leaves oval or elliptic . . . . . **6. MOEHRINGIA.**

Seeds not appendaged; flowers mostly in cymes; leaves usually linear. **7. ARENARIA.**

1. LYCHNIS L.

Annuals or perennials, with viscid pubescence; calyx often inflated, 10-nerved, 5-toothed; petals small or large; stamens 10.

Petals much longer than the calyx; plants 0.6 to 1 meter high . . . . . **1. L. alba.**

Petals not exserted from the calyx; plants 5 to 20 cm. high . . . . . **2. L. apetala.**

1. Lychnis alba Mill. WHITE CAMPION. Scattered plants found in several places. Native of Eur.; naturalized as a weed in N. Amer.—Plants stout, branched, very viscid; leaves ovate to lance-oblong; petals white; calyx becoming very large in fruit.

Several large plants grew in the flower beds at the Glacier Park Hotel in 1919, and they were rather showy. The flowers open in the evening and close in the forenoon; some of them are pistillate and others staminate.

2. Lychnis apetala L. BLADDER CAMPION. Occasional above timber line on the highest rock slides. Alaska to Utah, Colo., Lab., and Greenl.; also in Eur. and Asia. (*Wahlbergella apetala* Fries.)—Perennial, branched, finely hairy and viscid; leaves linear, 2 to 5 cm. long; flowers mostly solitary, long-stalked, nodding; calyx bladder-like, purplish, 12 to 15 mm. long; petals very small.

An uncommon but attractive little plant, whose inflated purple-striped calyces suggest Chinese lanterns.

2. SILENE L.

Perennials; leaves narrow; flowers solitary or in cymes; calyx with short lobes, 10-nerved; petals 5, with an appendage at the upper end of the claw; styles 3.

Plants almost stemless, rarely more than 5 cm. high; petals pink or purple; leaves 5 to 15 mm. long . . . . . **1. S. acaulis.**

Plants 15 to 40 cm. high; petals white or nearly so; leaves 30 to 80 mm. long. **2. S. multicaulis.**

1. Silene acaulis L. CARPET PINK. Common above timber line, in meadows or on rock slides; rarely found on open slopes at middle altitudes. Alaska to Ariz., N. H., and Greenl.; also in Eur. and Asia.—Plants forming very dense mats 10 to 60 cm. wide; leaves linear; flowers solitary on short erect stems; calyx 5 to 6 mm. long; petals merely notched.

A beautiful plant, the mats densely covered with the bright flowers. The flowers, unfortunately, last only a short time.

2. Silene multicaulis Nutt. CATCHFLY. Common at nearly all altitudes, in woods or meadows or on open slopes or rock slides. B. C. to Oreg., Wyo., and Alta.—Stems tufted, very sticky; leaves linear to oblanceolate; calyx 1.5 cm. long; petals 2 to 2.5 cm. long (including the claw), 2-lobed.

The flowers are rather showy; they open in the evening and close in the forenoon. Sometimes they are tinged with pink.

3. CERASTIUM L. Mouse-ear chickweed.

Perennials, with viscid pubescence; flowers in cymes; petals white; stamens 10; capsule opening by 10 small teeth.

Leaves linear, acute . . . . . **1. C. strictum.**
Leaves oblong to oval, obtuse or acutish.
Petals scarcely if at all longer than the sepals . . . . . **2. C. vulgatum.**
Petals much longer than the sepals.
Sepals 7 to 8 mm. long; petals about 10 mm. long . . . . . **3. C. alpinum.**
Sepals 4 to 5 mm. long; petals 6 to 8 mm. long . . . . . **4. C. beeringianum.**

1. Cerastium strictum L. Common at nearly all altitudes but most abundant above timber line, in moist meadows, woods, or thickets, or on open slopes or rock slides. B. C. and Wash. to Colo. and S. Dak.; also in Eur. and Asia.—Stems tufted, 10 to 30 cm. long, finely hairy; leaves 1 to 2 cm. long; sepals about 5 mm. long; petals about twice as long as the sepals.

Perhaps only a form of *C. arvense* L.

2. Cerastium vulgatum L. Frequent on the west slope at low altitudes, in gardens or waste ground and along trails. Native of Eur. and Asia; adventive in N. Amer.—Stems ascending, 10 to 30 cm. long; leaves 1 to 3 cm. long; sepals 5 mm. long.

3. Cerastium alpinum L. Frequent above timber line, on rocky slopes and rock slides. Alaska to Mont., Que., and Greenl.; also in Eur. and Asia.—Stems ascending, 10 to 20 cm. long; leaves 0.5 to 2 cm. long; cymes 2 or 3-flowered or the flowers often solitary.

4. Cerastium beeringianum Cham. & Schlecht. At nearly all altitudes, but most abundant above timber line, in meadows, on rock slides, or along streams and lakes. Alaska to Ariz., Alta., and Que.—Stems clustered, ascending, 5 to 20 cm. long, very viscid; leaves 0.5 to 2 cm. long.

This species is doubtfully distinct from *C. alpinum*.

4. STELLARIA L. Chickweed.

Annuals or perennials, glabrous or pubescent; leaves broad or narrow; sepals 5; petals 5 or wanting, deeply 2-lobed, white.

Plants with fine gland-tipped hairs . . . . . **1. S. americana.**
Plants without gland-tipped hairs, usually glabrous.
Bracts of the inflorescence, at least the uppermost, scarious, whitish.
Petals as long as the sepals or slightly longer . . . . . **2. S. longipes.**
Petals minute or none.
Leaves oblong-lanceolate; pedicels reflexed in age . . . . . **3. S. umbellata.**
Leaves linear; pedicels ascending . . . . . **4. S. alpestris.**
Bracts all green, never scarious.
Leaves linear or lanceolate, more than 4 times as long as broad.
Petals minute or usually none . . . . . **5. S. borealis.**
Petals as long as the sepals.
Leaves bluish green; plants less than 10 cm. high . . . . . **6. S. laeta.**
Leaves bright green; plants usually more than 10 cm. high. **7. S. crassifolia.**
Leaves lance-ovate to broadly ovate, less than 4 times as long as broad.
Leaves long-petioled . . . . . **8. S. media.**
Leaves sessile or nearly so.
Sepals acute . . . . . **9. S. crispa.**
Sepals obtuse . . . . . **10. S. obtusa.**

1. Stellaria americana (Porter) Standl. Frequent on rock slides and exposed rocky slopes above timber line; occasionally found on rocky slopes at middle altitudes, especially near snow banks. Mont. (*Alsine americana* Rydb.)—Stems very leafy, forming loose prostrate mats; leaves ovate or oval, 1 to 3 cm. long, usually obtuse; petals longer than the sepals.

The plant is extremely viscid when fresh.

2. Stellaria longipes Goldie. Occasional on the east slope at low altitudes, in moist meadows or thickets. Alaska to Colo., Que., and Greenl. (*Alsine longipes* Coville.)—Perennial, with slender, usually erect stems: leaves linear, 1 to 3 cm. long, often shining, acute; flowers on long slender stalks; calyx 4 to 5 mm. long.

3. Stellaria umbellata Turcz. Occasional above timber line, on open rocky slopes; sometimes in woods at middle altitudes. Oreg. to N. Mex. and Mont.; also in Asia. (*Alsine baicalensis* Coville.)—Stems very slender, erect or ascending, 5 to 20 cm. high; leaves 5 to 20 mm. long, acute; sepals 2 to 2.5 mm. long, about half as long as the capsule.

4. Stellaria alpestris Fries. Occasional on the east slope at low altitudes, in bogs. Alta. to Colo. and Ont.; also in Eur. (*Alsine alpestris* Rydb.)—Stems very slender, 20 to 40 cm. high, glabrous, erect or ascending; leaves 2 to 6 cm. long, acute; sepals 3 mm. long.

5. Stellaria borealis Bigel. Frequent at low and rarely at middle altitudes, in damp woods or thickets. Alaska to Calif., Colo., N. J., and Lab. (*Alsine borealis* Britton.)—Stems slender, 15 to 40 cm. long, erect or sometimes procumbent, glabrous; leaves 1 to 4 cm. long; flowers slender-stalked; sepals 3 to 4 mm. long.

6. Stellaria laeta Richards. BLUE CHICKWEED. Open rocky slopes near Piegan Pass. Alaska to Calif. and N. Mex. (*Alsine laeta* Rydb.)—Stems very leafy, tufted; leaves 1 to 2 cm. long, acute; flowers mostly solitary in the leaf axils; petals about 5 mm. long.

The plant is very different from the other species in its pale bluish leaves.

7. Stellaria crassifolia Ehrh. Wet thicket near St. Mary. Alta. to Colo., Pa., and Lab. (*Alsine crassifolia* Britton.)—Stems very slender, 15 to 30 cm. long, glabrous; leaves 5 to 20 mm. long, oblong-lanceolate, acute; petals slightly longer than the acute sepals.

8. Stellaria media (L.) Cyrill. COMMON CHICKWEED. Abundant about Lewis's. Native of Eur.; naturalized as a weed in N. Amer. (*Alsine media* L.)—Annual, with slender prostrate stems; leaves broadly ovate, 5 to 20 mm. long, acute or obtuse, thin; sepals minutely glandular-hairy; petals shorter than the sepals.

9. Stellaria crispa Cham. & Schlecht. Frequent at nearly all altitudes, in moist woods or thickets or on open slopes. Alaska to Calif., Wyo., and Alta. (*Alsine crispa* Holzinger.)—Stems very slender, prostrate, 10 to 30 cm. long; leaves ovate, 5 to 20 mm. long, acute; petals minute or none.

10. Stellaria obtusa Engelm. Frequent at middle altitudes and sometimes above timber line, in woods or on open slopes. B. C. and Wash. to Colo. and Alta. (*Alsine obtusa* Rose.)—Stems slender, 10 to 20 cm. long, prostrate, forming dense mats, glabrous; leaves 4 to 10 mm. long, acute; petals none or minute.

5. SAGINA L.

1. Sagina saginoides (L.) Britton. PEARLWORT. Frequent at all altitudes but most common at middle elevations, on moist banks or slopes or in woods, often along banks of streams and lakes. Alaska to Calif., N. Mex., Que., and Greenl.; also in Eur. and Asia.—Slender perennial, 2 to 8 cm. high, loosely tufted, glabrous or nearly so; leaves filiform, 5 to 12 mm. long; flowers on slender stalks in the leaf axils; sepals 1.5 to 2 mm. long, very obtuse; petals much shorter than the sepals, white.

6. MOEHRINGIA L.

1. Moehringia lateriflora (L.) Fenzl. Frequent at low or sometimes at middle altitudes, in moist woods or thickets. Alaska to Oreg., N. Mex., N. J., and Lab.; also in Eur. and Asia. (*Arenaria lateriflora* L.)—Perennial; stems slender, 10 to 20 cm. long, tufted, minutely hairy; leaves oval to oblong, 1 to 3 cm. long, mostly obtuse; flowers white, axillary or in cymes; sepals obtuse; petals 4 to 5 mm. long, longer than the sepals; seeds black and shining, with a small pale appendage.

7. ARENARIA L. SANDWORT.

Perennials, often tufted or matted; leaves linear or needle-like; flowers in cymes or often solitary; petals 5, white; stamens 10; capsule opening by 3 valves, these often 2-cleft.

Stems glabrous . . . . . **1. A. rossii.**
Stems finely glandular-hairy.
  Sepals acute.
    Sepals 3 mm. long, 3-nerved; petals usually longer than the sepals.
2. A. propinqua.
    Sepals 4 to 5 mm. long, 1-nerved; petals shorter than the sepals . . **3. A. nuttallii.**
  Sepals obtuse.
    Leaves mostly 2 to 10 cm. long; stems usually with numerous flowers; valves of the capsule 2-lobed . . . . . **4. A. formosa.**
    Leaves 2 to 6 mm. long; stems with 1 to 4 flowers; valves of the capsule entire.
      Sepals glabrous or minutely puberulent; capsule 4 to 6 mm. long.
5. A. sajanensis.
      Sepals with short but slender gland-tipped hairs; capsule 6 to 8 mm. long.
6. A. laricifolia.

1. Arenaria rossii (Richards.) R. Br. Common above timber line, especially on rock slides. Alaska to Wash. and Colo. (*Alsinopsis rossii* Rydb.)—Stems 1 to 5 cm. high, tufted; leaves 4 to 8 mm. long, linear; flowers usually solitary; sepals 3 mm. long, acute.

2. Arenaria propinqua Richards. Frequent at nearly all altitudes, especially above timber line, in meadows or moist thickets, along creek beds, or on open slopes or rock slides. B. C. to Calif., N. Mex., and Mack. (*Alsinopsis propinqua* Rydb.)—Stems 3 to 10 cm. high, very slender, loosely branched and tufted; leaves very slender, 5 to 10 mm. long.

3. Arenaria nuttallii Pax. Frequent above timber line, on rock slides or exposed summits or in meadows. B. C. to Calif., Wyo., and Alta. (*Alsinopsis occidentalis* Heller.)—Stems 10 to 15 cm. high, loosely matted; leaves ascending, sharp-pointed, 6 to 12 mm. long, very viscid.

4. Arenaria formosa Fisch. GRASS SANDWORT. Common at nearly all altitudes but most abundant above timber line, in meadows or on open slopes or rock slides. B. C. to Calif., Utah, and Alta.—Stems 10 to 20 cm. high, densely tufted; leaves grasslike, mostly basal; petals 6 to 9 mm. long, much longer than the sepals.

A rather conspicuous plant.

5. Arenaria sajanensis Willd. Frequent above timber line, in meadows or on rock slides. Alaska to Oreg., Ariz., Alta., Que., and Greenl.; also in Asia.—Stems 2 to 5 cm. high, usually forming dense mats; petals equaling or slightly longer than the sepals; seeds not beaked.

6. Arenaria laricifolia L. Frequent at high and middle altitudes, in meadows or on rock slides or open slopes; sometimes found at low altitudes in exposed places Yukon to Oreg. and Wyo.; also in Eur. and Asia. (*Alsinopsis laricifolia* Heller.)—Stems

2 to 10 cm. high, usually forming dense, large or small mats; petals longer than the sepals; seeds with a thick beak.

Some of our material may be referable to *A. obtusiloba* (Rydb.) Fernald, but the differences between the two species are not clearly defined.

30. NYMPHAEACEAE. Waterlily Family.

1. NYMPHAEA L.

1. Nymphaea polysepala (Engelm.) Greene. YELLOW POND LILY. In small lakes on the west slope. Alaska to Calif., Colo., and S. Dak.—Perennial with very thick rootstocks; leaves long-petioled, floating, oval, 20 to 40 cm long, cordate at base; flowers long-stalked, green and yellow, tinged with red; sepals 6 to 12, the petals very small; fruit a leathery berry, 3 to 8 cm. long, containing numerous brown seeds.

The plants grow in shallow or deep water, and the petioles and peduncles are often very long. The seeds, under the name of "wokas," are much used for food by some of the Indians of the Pacific coast.

31. RANUNCULACEAE. Buttercup Family.

Herbs or climbing shrubs; leaves usually alternate, simple or compound; flowers regular or irregular; sepals 3 to 15, usually green but often colored and petal-like; petals as many as the sepals or wanting; stamens usually numerous, rarely 5; fruit dry or fleshy.

Plants climbing shrubs; leaves opposite . . . . . 1. CLEMATIS.
Plants herbs, never climbing; leaves alternate.
  Flowers in racemes, blue or white.
    Petals white, not spurred; fruit a white or red berry . . . . . 2. ACTAEA.
    Petals blue, some of them with spurs; fruit of dry pods . . . 3. DELPHINIUM.
  Flowers not in racemes, of various colors.
    Fruit of several pods, each containing several seeds.
      Flowers with spurs, yellow or blue; leaves with numerous leaflets. 4. AQUILEGIA.
      Flowers not spurred, white; leaves with few divisions . . . . . 5. TROLLIUS.
    Fruit a head of few or many (1-seeded) achenes.
      Plants submerged in water; leaves all divided into threadlike lobes. 7. BATRACHIUM.
      Plants not growing in water or, if so, the leaves not divided into narrow lobes.
        Leaves narrowly linear; stems naked . . . . . 6. MYOSURUS.
        Leaves not linear; stems usually leafy or with bracts.
          Petals and sepals present; petals yellow.
            Achenes with longitudinal ribs; stems creeping, rooting at the joints; leaves with small rounded teeth . . . . . 8. HALERPESTES.
            Achenes not ribbed; stems neither creeping nor rooting or, if so, either entire or sharply toothed . . . . . 9. RANUNCULUS.
          Petals none, but the sepals often resembling petals; sepals never yellow.
            Achenes few, not hairy; flower stems not bearing a pair or whorl of leaves below the flowers; sepals greenish . . . 10. THALICTRUM.
            Achenes many, hairy; flower stems with a pair or whorl of leaves below the flowers; sepals white to blue or purple.
              Achenes with long hairy tails in fruit; sepals 2 to 3.5 cm. long. 11. PULSATILLA.
              Achenes not tailed; sepals less than 2 cm. long . . . 12. ANEMONE.

1. CLEMATIS L.

Somewhat woody vines; leaves opposite, composed of 3 to 7 leaflets; flowers solitary or panicled; sepals 4, petal-like; petals very small or usually wanting; fruit a head of achenes, each achene with a long hairy tail.

Sepals white, about 1 cm. long; leaflets 5 or 7, toothed . . . . . 1. C. ligusticifolia.
Sepals purple, 3 to 5 cm. long; leaflets 3, entire . . . . . 2. C. columbiana.

1. Clematis ligusticifolia Nutt. WHITE CLEMATIS. At low altitudes on rocky banks or hillsides; scarce. B. C. to Calif., N. Mex., and N. Dak.—Low vine; leaflets 3 to 6 cm. long, with appressed hairs; flowers in loose panicles; tails of the achenes 4 to 5 cm. long.

2. Clematis columbiana (Nutt.) Torr. & Gray. PURPLE CLEMATIS. PLATE 48, A. Frequent at low and middle altitudes, in aspen thickets or moist woods. B. C. and Wash. to Colo. and Alta. (*Atragene columbiana* Nutt.)—Low vine; leaflets 3 to 10 cm. long, thin, sharp-pointed, usually entire; sepals sharp-pointed.

A showy and attractive plant, but it blooms too early in the season to be seen by many visitors to the park. The Blackfoot name for the purple clematis is "ghost's lariat," in allusion to the fact that the slender, tough stems catch people's feet and trip them unexpectedly.

2. ACTAEA L.

1. Actaea rubra (Ait.) Willd. BANEBERRY. Common at low and middle altitudes, usually in moist woods or thickets. Alaska to Calif., N. Mex., N. J., and Newf.—Perennial, with thick rootstocks, 0.5 to 1 meter high, glabrous or nearly so; leaves large, composed of numerous lobed and toothed thin leaflets 5 to 10 cm. long; flowers white, the petals 2 to 3 mm. long; stamens numerous, white, much longer than the petals; fruit berrylike, with several seeds.

The flowers are inconspicuous, but the fruiting plants are very showy and handsome. The fruit is remarkably variable, and because of this fact some authors would divide the Glacier Park material into three species. The typical form has bright red fruit, 10 to 12 mm. long. *A. rubra neglecta* (Gillman) Robinson (*A. eburnea* Rydb.) has white fruit which appears as if made of china. The forms with red and with white fruit are about equally common and grow together; the plants differ in no other respects, and can scarcely be considered distinct species. One plant was noticed by the writer in which the upper fruits of the raceme were bright red, while the lower ones were almost white, with a faint tinge of pink. The fruit varies also in size, and *A. arguta* Nutt. is a form with globose fruit only 5 to 6 mm. long. This form is often found with the large-fruited plants, and does not appear to be of systematic importance. The smaller fruits are most commonly red, but not infrequently white.

According to McClintock, the Blackfoot Indians used the boiled roots as a remedy for coughs and colds.

3. DELPHINIUM L. LARKSPUR.

Erect perennials with simple stems; leaves long-petioled, divided into numerous narrow lobes; flowers large, blue, in racemes; sepals petal-like, one of them produced into a long spur; petals 2 or 4, small; stamens numerous; fruit of 3 or 4 pods.

Roots tuber-like; sepals about 1 cm. long; pods usually about 1 cm. long. 1. D. depauperatum.
Roots thick, clustered, not tuber-like; sepals about 1.5 cm. long; pods 1.5 to 2 cm. long. 2. D. bicolor.

1. Delphinium depauperatum Nutt. Frequent in meadows just above timber line. Wash. to Calif., Wyo., and Mont.—Stems 20 to 40 cm. high, finely hairy above; stem leaves numerous, about 3 cm. long, divided into narrow lobes, glabrous or somewhat hairy; flowers few, dark blue, about 1 cm. long; petals whitish; pods glabrous or finely hairy.

One of the conspicuous plants of alpine meadows, but seldom occurring in great abundance.

2. Delphinium bicolor Nutt. East entrance, on prairie, *Umbach*. Wash. to Utah and Sask.—Stems stout, 20 to 40 cm. high, hairy, at least above; leaves 2 to 4 cm. wide, finely hairy or nearly glabrous; flowers deep blue, 1.5 cm. long; petals yellowish or whitish; pods hairy or glabrous.

4. AQUILEGIA L. COLUMBINE.

Perennials with thick roots; stems often branched, bearing 1 or numerous flowers; leaves with numerous lobed leaflets; sepals 5, petal-like; petals 5, each with a long spur at the base; stamens numerous; fruit of 5 pods.—Red columbine has been reported from the region, but probably does not occur here.

Flowers yellow; stems several-flowered . . . . . **1. A. flavescens.**
Flowers blue; stems usually 1-flowered . . . . . **2. A. jonesii.**

1. Aquilegia flavescens S. Wats. YELLOW COLUMBINE. Common above and near timber line, in meadows, or on rocky slopes or rock slides; occasionally found at middle elevations in woods. B. C. to Oreg., Wyo., and Alta.—Stems 20 to 60 cm. high, usually in clumps; leaflets 1 to 4 cm. long, 3-lobed; sepals usually sulphur-yellow, but sometimes very pale or occasionally salmon-pink; petals pale yellow, 5 to 8 mm. long; spurs 1 to 1.5 cm. long; pods about 2 cm. long.

A very handsome plant. The flowers vary greatly in size, and there are numerous color forms.

2. Aquilegia jonesii Parry. BLUE COLUMBINE. Frequent on the highest rock slides and on exposed rocky alpine slopes. Alta. to Wyo.—Plants 5 to 10 cm. high, finely pubescent; leaves basal, 1 to 5 cm. wide, the leaflets glaucous, small and crowded; flower erect, the sepals 1.5 cm. long; spurs 8 to 10 mm. long; pods 1.5 to 2 cm. long.

A showy plant whose flowers last only a short time.

2a. Aquilegia jonesii elatior Standl., subsp. nov. Similar in general appearance to *A. jonesii*, but the stems taller, 10 to 20 cm. high, usually 1-flowered but occasionally 2-flowered, naked or often leafy-bracted; leaves 7 to 12 cm. high, the leaflets somewhat larger than in the species, not crowded; flowers like those of the species, the petals often white.

Type in the U. S. National Herbarium, no. 1025123, collected on a rock slide above Cracker Lake, Glacier National Park, Montana, altitude 1,920 meters, July 15, 1919, by P. C. Standley (no. 15765). Also collected on rock slide above Iceberg Lake, July 26, 1919 (no. 16407).

This grows with typical *A. jonesii*, and at first glance it appears quite distinct. While in the field it was presumed that two species of blue columbine were represented in Glacier Park, but close examination of the specimens secured does not reveal any constant differences between the two forms. *A. jonesii elatior* is a larger, greener, less pubescent plant than *A. jonesii*, and has larger leaves whose leaflets are not crowded as in that species. It seems best to regard it as only a form of *A. jonesii*, a view confirmed by Mr. Edwin B. Payson, who has examined the material.

5. TROLLIUS L.

1. Trollius albiflorus (A. Gray) Rydb. GLOBEFLOWER. Common above and near timber line, in wet meadows; often about snow banks. B. C. and Wash. to Color and Alta.—Glabrous perennial, 20 to 50 cm. high, with rootstocks; stems leafy, 1 or few-flowered; leaves parted and lobed, 4 to 8 cm. long; sepals 5 to 7, white; petal, linear, 3 to 5 mm. long; fruit of 10 to 20 pods about 1 cm. long.

One of the characteristic plants of alpine meadows, springing up quickly after snow leaves the ground, the stems sometimes even pushing up through thin snow. The flowers are conspicuous, but they are of a dirty white color and not particularly attractive.

6. MYOSURUS L.

1. Myosurus lepturus (A. Gray) Howell. MOUSETAIL. Plains at east entrance, *Umbach.* Annual, 3 to 10 cm. high, glabrous; leaves basal, threadlike, 2 to 4 cm. long; stems 1-flowered; sepals 5, spurred at the top, about 2 mm. long; petals greenish yellow, very small; fruit a slender spike of small beaked achenes.

7. BATRACHIUM S. F. Gray. WATER BUTTERCUP.

Perennials, growing in water; stems branched, very leafy; leaves much divided into threadlike lobes; flowers small, solitary; petals 5, white; fruit a head of small wrinkled achenes.

Petals broadly obovate, 5 to 7 mm. long; stamens numerous . . . . . **1. B. flaccidum.**
Petals oblong-obovate, 3 to 5 mm. long; stamens 5 to 12 . . . . . **2. B. drouetii.**

1. Batrachium flaccidum (Pers.) Rupr. Snyder Lake and Swiftcurrent Creek. Wash. to Calif., N. C., and Lab.—Stems slender, glabrous; leaves 1.5 to 3 cm. long; achenes finely hairy.

2. Batrachium drouetii (Schultz) Nyman. Frequent in ponds and pools. Widely distributed in N. Amer., Eur., and Asia.—Plants slender, glabrous; leaves 1 to 2 cm. long; head of achenes globose, 4 mm. thick.

The species of this genus are not well understood, and the differences between them are imperfectly distinguishable.

8. HALERPESTES Greene.

1. Halerpestes cymbalaria (Pursh) Greene. ALKALI BUTTERCUP. Frequent about east entrance in low places on prairie, sometimes in alkaline spots. Alaska to Calif., N. Mex., N. J., and Lab.; also in Mex. and S. Amer. (*Ranunculus cymbalaria* Pursh.)—Perennial with long slender runners; leaves heart-shaped or kidney-shaped, glabrous, 0.5 to 3 cm. long, with low rounded teeth; flower stems 2 to 10 cm. long, 1 to 7-flowered; petals 3 to 5 mm. long, yellow; fruit heads longer than broad.

9. RANUNCULUS L. BUTTERCUP.

Perennials with fleshy-fibrous roots; leaves entire, toothed, or compound; flowers solitary or in cymes; sepals 5; petals 5, yellow; fruit a head of achenes.

Leaves all entire . . . . . **1. R. reptans.**
Leaves toothed, lobed, or divided.
  Plants creeping, the stems rooting at the joints, growing on mud or at the edge of water . . . . . **2. R. purshii.**
  Plants not creeping and rooting at the joints.
    Lowest leaves compound, divided into 3 or more leaflets.
      Stems glabrous . . . . . **3. R. oreganus.**
      Stems very hairy . . . . . **4. R. macounii.**
    Lowest leaves toothed or lobed but never divided to the base.
      Achenes with a hooked beak. Stems with long spreading hairs. **5. R. bongardi.**
      Achenes with a straight beak or none.
        Achenes finely hairy; lowest leaves with rounded teeth, not lobed. **6. R. inamoenus.**
        Achenes glabrous; lowest leaves lobed.
          Petals 5 to 6 mm. long . . . . . **7. R. alpeophilus.**
          Petals 8 to 12 mm. long.
            Head of achenes somewhat oblong, longer than broad . . **8. R. saxicola.**
            Head of achenes globose . . . . . **9. R. suksdorfii.**

1. Ranunculus reptans L. CREEPING BUTTERCUP. Frequent at low altitudes, in mud or sand along streams and lakes; also abundant on wet slopes at Swiftcurrent Pass. Alaska to N. Mex., N. J., and Lab.—Stems creeping, slender, glabrous, 5 to 30 cm. long; leaves linear to oblanceolate, 1 to 3 cm. long; petals 2 to 4 mm. long; fruit heads globose.

2. Ranunculus purshii Richards. Occasional on the east slope at low altitudes, about pools or along streams. Alaska to Colo., Ont., and N. S. (*R. limosus* Nutt.)—Stems glabrous or hairy; leaves 1 to 2 cm. wide, deeply lobed, the lobes narrow; petals 4 to 5 mm. long; fruit heads globose, about 5 mm. long.

The typical form is glabrous; the hairy form is *R. limosus* Nutt., but there seem to be no constant differences between the two. Both are found in the park.

3. Ranunculus oreganus (A. Gray) Howell. Wooded swamp below Lake McDermott. Wash. and Oreg. to Mont.—Stems stout, 20 to 50 cm. high; leaflets deeply lobed and toothed; petals 5 to 7 mm. long; achenes glabrous.

4. Ranunculus macounii Britton. Occasional at low and sometimes at middle altitudes, in wet woods or thickets or about pools on prairie. B. C. to N. Mex., Iowa, and Ont.—Stems 20 to 60 cm. long, erect or decumbent, branched; leaflets hairy, lobed and toothed, 3 to 8 cm. long; petals 5 to 7 mm. long; fruit heads globose.

5. Ranunculus bongardi Greene. Frequent at low and sometimes at middle altitudes, in moist woods or thickets. Alaska to Oreg. and Colo.—Stems erect, 30 to 60 cm. high; lower leaves 3 to 10 cm. wide, deeply lobed and toothed; petals slightly longer than the sepals; achenes flattened, sometimes hairy when young.

6. Ranunculus inamoenus Greene. East slope at low altitudes, on open hillsides or along streams; scarce. Idaho and Mont. to N. Mex.—Stems stout, 20 to 30 cm. high; basal leaves rounded or fan-shaped, toothed, or some of them lobed, the upper leaves deeply lobed; petals 5 to 6 mm. long; head of achenes oblong.

7. Ranunculus alpeophilus A. Nels. Frequent above timber line, in meadows or on rocky slopes or rock slides. Idaho and Mont. to Colo.—Stems 10 to 30 cm. high, glabrous, mostly 1-flowered; leaves 1.5 to 4 cm. wide, deeply lobed, the lobes obtuse; head of achenes oblong.

8. Ranunculus saxicola Rydb. Occasional on rocky slopes above timber line. Alta. to Wyo. and Utah. (*R. ramulosus* Jones).—Stems glabrous, 10 to 15 cm. high; lower leaves 2 to 4 cm. wide, lobed, the lobes usually acutish; stem leaves often lobed to the base, the lobes narrow.

9. Ranunculus suksdorfii A. Gray. On moist cliffs at Cracker Lake. Wash. to Alta. and Mont.—Stems glabrous, about 10 cm. high, usually 1-flowered; basal leaves 1.5 to 3 cm. wide, lobed, the lobes acutish; stem leaves 3 or 5-cleft, with narrow lobes.

The last three species are closely related, and it is doubtful whether they are distinct. They are showy plants which are often abundant and conspicuous in alpine localities, frequently flowering up to the very edges of the snow banks.

10. THALICTRUM L. MEADOW-RUE.

Tall perennials with rootstocks and yellow roots, glabrous or nearly so; leaves composed of numerous broad, toothed or lobed, stalked leaflets; petioles with dilated sheathing bases; flowers greenish; sepals 4 or 5; petals none; stamens numerous, long and conspicuous; fruit of several ribbed achenes.

Achenes less than 3 times as long as broad, 2.5 to 3.5 mm. wide . **1. T. megacarpum.**
Achenes about 4 times as long as broad, 2 mm. wide . . . . . **2. T. occidentale.**

1. Thalictrum megacarpum Torr. Common nearly everywhere except on prairie and at the highest altitudes, usually in moist woods or thickets, sometimes in meadows or on open slopes. Idaho and Mont. to Colo.—Stems 30 to 80 cm. high; leaflets thin, 1.5 to 6 cm. wide, pale beneath; achenes 6 to 8 mm. long.

The leaves are graceful and handsome, and in a vague way suggest those of the maidenhair fern, with which the plant is frequently confused in the West; in autumn they turn yellow. The flowers are not conspicuous. Our material is rather variable, and some of it might be referred to *T. columbianum* Rydb.

2. Thalictrum occidentale A. Gray. Avalanche Lake, on brushy slopes. B. C. to Calif., Utah, and Alta.—Stems 50 to 80 cm. high; leaflets 1.5 to 5.5 cm. wide, 3-lobed and with rounded teeth; achenes 6 to 8 mm. long.

11. PULSATILLA Adans.

Perennial herbs; leaves borne at the base of the stem, divided into numerous narrow lobes; stem bearing 3 whorled bracts similar to the leaves; flowers usually 1 to a stem, with 5 to 7 colored sepals and no petals; fruit of numerous achenes, each with a long hairy tail.

Flowers purple or bluish; bracts sessile . . . . . **1. P. ludoviciana.**
Flowers white, sometimes tinged with purple; bracts short-stalked. **2. P. occidentalis.**

1. Pulsatilla ludoviciana (Nutt.) Heller. PASQUE-FLOWER. Frequent on the east slope at low altitudes, on prairie or open hillsides. B. C. and Wash. to Tex. and Ill.—Stems 10 to 40 cm. high; leaves very hairy, 5 to 10 cm. long; sepals ovate-oblong, 2.5 to 3.5 cm. long.

The plants bloom in spring.

2. Pulsatilla occidentalis (S. Wats.) Freyn. CHALICE-FLOWER. Frequent in a few places above timber line, in low meadows; also at Grinnell Lake. Alaska to Calif., Mont., and Alta. (*Anemone occidentalis* S. Wats.)—Stems short at flowering time, but becoming 30 to 60 cm. high; leaves 3-parted, the divisions pinnately divided into numerous lobes, green, thinly hairy; sepals 2 to 2.5 cm. long; tails of the fruit silky, bent downward in fruit, the head of fruit broad above and narrow below.

The plants bloom early, but they are very handsome even in fruit. The soft, silky heads are most attractive.

12. ANEMONE L. ANEMONE.

Perennials with rootstocks; leaves basal, deeply lobed or parted; stem bearing 3 leaflike bracts; flowers few or solitary; sepals 4 or more, usually 5, petal-like; petals none; fruit a head of woolly achenes.

Leaves divided into 3 broad wedge-shaped leaflets, these toothed or with few short broad lobes . . . . . **1. A. parviflora.**
Leaves 2 to 4 times divided into numerous narrow lobes.
Leaves nearly glabrous, the lobes obtuse; style 2 to 3 mm. long . **2. A. tetonensis.**
Leaves hairy, the lobes acute; style 1 to 2 mm. long . . . . . **3. A. globosa.**

1. Anemone parviflora Michx. NORTHERN ANEMONE. Frequent above timber line, in meadows or on rocky slopes; also in cold bog below Lake McDermott. Alaska to Colo., Ont., and Lab.; also in Asia.—Stems slender, 5 to 20 cm. high; 1-flowered; leaflets 1 to 2 cm. long, thinly hairy beneath; sepals 8 to 12 mm. long, white or tinged with blue.

2. Anemone tetonensis Porter. ALPINE ANEMONE. Frequent above timber line, in meadows and on rock slides. B. C. and Wash. to Wyo. and Alta.—Stems 10 to 20 cm. high, mostly 1-flowered; leaves 1.5 to 3 cm. long; sepals 6 to 12. mm. long, bluish white or pale blue; fruit heads 1 to 1.5 cm. long.

3. Anemone globosa Nutt. COMMON WESTERN ANEMONE. Common above timber line, in meadows or on rock slides; sometimes at low or middle elevations, in meadows or thickets. Alaska to Calif., N. Mex., and S. Dak.—Stems 15 to 40 cm. high, hairy, 1 to 3-flowered; leaves 3 to 5 cm. long; sepals 6 to 12 mm. long, yellowish within, blue or purplish outside; fruit heads about 1 cm. in diameter.

32. BERBERIDACEAE. Barberry Family.

1. BERBERIS L.

The cultivated barberry belongs to this genus.

1. Berberis repens Lindl. OREGON GRAPE. Common in woods and thickets at low and middle altitudes. B. C. to Alta., Calif., and N. Mex.—Small shrub, usually about 30 cm. high; leaves pinnate; leaflets 3 to 7, leathery, the teeth with bristly tips; flowers yellow, in racemes; fruit blue, very juicy, sour, containing few large seeds.

The leaves persist throughout the winter; in autumn they are handsomely tinted with red or purple. The flowers appear in spring. The fruit is edible but too sour to be very pleasant; it is often used for making jelly. A closely related species of Oregon grape is the State flower of Oregon. The Blackfoot Indians used a decoction of the roots as a remedy for stomach affections and for hemorrhages.

33. PAPAVERACEAE. Poppy Family.

1. PAPAVER L. POPPY.

The cultivated poppies, one of which furnishes opium, belong to this genus.

1. Papaver pygmaeum Rydb. ALPINE POPPY. On high alpine summits and rock slides; abundant at Piegan Pass and Sexton Glacier, and occasional elsewhere. B. C., Alta., and Mont.—Plants small, tufted; leaves forming a dense cluster, deeply lobed; flowers solitary on slender stalks 3 to 6 cm. high; sepals 2; petals 4, scarcely 1 cm. long, orange, with a pale yellow spot at the base.

A very small plant, with little resemblance in general appearance to the common poppies. It is found only in the highest and most exposed situations.

34. FUMARIACEAE. Fumitory Family.

1. CAPNOIDES Adans.

Annuals or biennials, with succulent stems; leaves alternate, bipinnately dissected; flowers in racemes; petals 4, one of the outer ones spurred at the base; fruit a long narrow pod.

Flowers yellow; plants ascending, 30 cm. high or less . . . . . **1. C. aureum.**
Flowers purplish pink; plants erect, usually 30 to 60 cm. high . **2. C. sempervirens.**

1. Capnoides aureum (Willd.) Kuntze. YELLOW CORYDALIS. On gravelly, open or brushy hillsides at low altitudes on the east slope; occasional. B. C. to Calif., Pa., and N. S. (*Corydalis aurea* Willd.)—Plants much branched from the base, green; flowers 12 to 15 mm. long, rather showy; pods 2 to 3 cm. long, 2 mm. thick; seeds black and shining.

2. Capnoides sempervirens (L.) Borkh. PINK CORYDALIS. In thin woods at low or middle altitudes; rare. Alaska and B. C. to N. C. and N. S. (*Corydalis sempervirens* Pers.)—Plants branched above, pale green; flowers 12 to 15 mm. long; pods 3 to 4 cm. long, 1.5 mm. thick.

35. BRASSICACEAE. Mustard Family.

Herbs, often with pungent juice; leaves alternate; flowers regular, mostly in racemes; sepals 4; petals 4; stamens usually 6; fruit a 2-celled pod.—The name Cruciferae is often used for the family.

Leaves not lobed, entire or toothed.
  Pods conspicuously flattened.
    Pods notched at the upper end, with a wing around the edge . . . **2. THLASPI.**
    Pods neither notched nor winged.
      Pods short, rounded to linear-oblong; flowers white or yellow . . **17. DRABA.**
      Pods long, linear; flowers white, pink, or purple . . . . . **18. ARABIS.**

Pods not flattened.
Pods linear, many times longer than thick.
Plants glabrous; leaves broad, pale, entire . . . . . **12. CONRINGIA.**
Plants with fine appressed hairs; leaves narrow, green, often toothed. **13. CHEIRINIA.**
Pods less than twice as long as thick.
Pods inflated and bladder-like, constricted in the middle . . . **5. PHYSARIA.**
Pods not inflated and bladder-like.
Plants gray with a close covering of fine branched hairs, low, usually less than 15 cm. high . . . . . **6. LESQUERELLA.**
Plants green, with coarse hairs, tall, usually 30 to 60 cm. high. **7. CAMELINA.**

Leaves, at least the lower ones, deeply lobed or divided.
Pods about as broad as long, flattened.
Pods 3-cornered . . . . . **3. BURSA.**
Pods rounded . . . . . **1. LEPIDIUM.**
Pods decidedly longer than broad, or rarely short but then not flattened.
Flowers white.
Plants densely and finely white-hairy; pods lanceolate . . . . **4. SMELOWSKIA.**
Plants green, slightly if at all hairy; pods linear.
Sides of the ripe pods recurving as the pod opens; plants growing in wet soil. **16. CARDAMINE.**
Sides of the pod remaining straight after the opening of the pod; plants mostly growing in dry soil . . . . . **18. ARABIS.**

Flowers yellow.
Pod with a long (5 to 15 mm.) distinct beak; upper leaves usually not lobed. **15. BRASSICA.**
Pods not beaked, or the beak very short (2 to 3 mm.); upper leaves usually lobed.
Pods 4-angled; plants glabrous . . . . . **14. CAMPE.**
Pods not 4-angled; plants glabrous or hairy.
Hairs of the stems branched; leaves twice divided into numerous small narrow lobes . . . . . **11. SOPHIA.**
Hairs of the stem simple; leaves once lobed, the lobes often large and broad.
Pods less than 2 cm. long . . . . . **8. RADICULA.**
Pods 3 to 10 cm. long.
Pods 7 to 10 cm. long; stem with spreading hairs . . . . . **9. NORTA.**
Pods 3 to 4 cm. long; stem with minute appressed hairs. **10. DIPLOTAXIS.**

1. LEPIDIUM L.

1. Lepidium densiflorum Schrad. PEPPERGRASS. Frequent at low altitudes, in waste or cultivated ground or on open slopes; apparently introduced. Yukon to N. Mex., N. Y., and Vt.—Annual, 20 to 50 cm. high, branched above, finely hairy; basal leaves lobed, the stem leaves narrow, toothed; petals minute or wanting; pod flat, rounded, 3 mm. long, notched at the apex.

2. THLASPI L.

1. Thlaspi arvense L. FANWEED. Common at low altitudes, especially on the east slope, in waste or cultivated ground or on prairie. Native of Eur.; introduced as a weed in N. Amer.—Glabrous annual, 10 to 50 cm. high; stem leaves oblong, toothed, clasping; flowers white, in long racemes, long-stalked; petals 4 mm. long; pods flat, rounded, 1 to 2 cm. long, broadly winged, notched at the top.

In cultivated ground this is often very abundant. Soon after flowering the plants turn yellow, and they are then conspicuous, even at a distance. In some parts of

the Northwest the name "Jim Hill weed" is applied to the species, the ranchmen having associated its appearance with the building of the Great Northern Railroad.

3. BURSA Weber.

1. Bursa bursa-pastoris (L.) Weber. SHEPHERD'S-PURSE. Frequent at low altitudes, in cultivated, waste, or dry ground. Native of Eur. and Asia; naturalized as a weed in N. Amer. (*Capsella bursa-pastoris* Medic.)—Annual, the pubescence of fine branched hairs; leaves on the stem and also forming a rosette at the base of the stem, deeply lobed or toothed, the stem leaves clasping; flowers white; petals 2 mm. long; fruit flat, triangular, 6 to 8 mm. long.

4. SMELOWSKIA C. A. Mey.

1. Smelowskia americana Rydb. WILD CANDYTUFT. Common above timber line on rock slides or open slopes; rarely found on open slopes at middle altitudes. Idaho and Mont. to Colo.—Perennial, 10 to 20 cm. high, forming dense tufts, densely covered with fine white branched hairs; leaves divided into narrow lobes; flowers white; pods lanceolate or oblong, 7 to 12 mm. long.

A very handsome plant, which remains in flower only a short time.

5. PHYSARIA A. Gray.

1. Physaria didymocarpa (Hook.) A. Gray. DOUBLE BLADDERPOD. On shale slopes of canyons near east entrance. Alta. and Sask. to Colo.—Perennial, 5 to 15 cm. high, forming small clumps; basal leaves broadly obovate, 2 to 6 cm. long, entire or somewhat toothed, densely covered with fine white branched hairs; petals yellow, 8 to 12 mm. long; pod 7 to 15 mm. broad, constricted at the middle, composed of 2 bladder-like cells.

McClintock states that the Blackfoot Indians used the roots as a remedy for sore throat and for pains in the stomach, and a decoction of the plant to reduce swellings.

6. LESQUERELLA S. Wats.

1. Lesquerella spathulata Rydb. BLADDERPOD. Occasional about the east entrance, on shale slopes or dry hillsides. Man. to Mont. and Utah.—Perennial, 3 to 12 cm. high, densely covered with fine white stellate hairs; basal leaves oblanceolate, 2 to 3 cm. long, entire; petals yellow, 7 to 8 mm. long; pod egg-shaped, 5 mm. long.

7. CAMELINA Crantz.

1. Camelina microcarpa Andrzej. FALSE FLAX. Occasional on the east slope at low altitudes, in waste ground or on open hillsides. Native of Eur.; naturalized in N. Amer.—Annual, 30 to 70 cm. high, the stem finely hairy; leaves lanceolate, clasping; petals 3 to 4 mm. long, yellowish; pod inflated, pear-shaped, 4 to 8 mm. long.

8. RADICULA Hill. YELLOWCRESS.

Annuals or perennials, growing in wet soil; leaves pinnately lobed; petals yellow; pods terete, cylindric or almost globose.

Pods slender-cylindric, 8 to 12 mm. long, about 1 mm. thick, usually somewhat curved.
1. R. curvisiliqua.

Pods oval or oblong, 5 to 8 mm. long, 1.5 to 2 mm. thick not curved.

Pedicels much shorter than the pods; plants spreading, the stems 10 to 25 cm. long.
2. R. lyrata.

Pedicels nearly or quite as long as the pods, sometimes longer; plants usually erect and 30 to 60 cm. high . . . . . **3. R. terrestris.**

1. Radicula curvisiliqua (Hook.) Greene. Occasional on the east slope at low altitudes, in moist meadows or about pools. Wash. and Oreg. to Wyo. and Mont.—

Annual or biennial, 10 to 40 cm. high, erect or spreading, glabrous or nearly so; petals 2.5 mm. long.

2. Radicula lyrata (Nutt.) Greene. East entrance, about pools. Wash. to Calif. Colo., and Mont.—Stems glabrous or nearly so; petals about 1 mm. long; pedicels 1 to 3 mm. long.

3. Radicula palustris (L.) Moench. Frequent at low altitudes, in wet thickets or about pools. Alaska to Mex., Ga., and Lab.; also in Eur. and Asia. (*R. terrestris* Woot. & Standl.)—Stems glabrous or nearly so, sometimes 60 to 90 cm. high; petals 2 mm. long.

9. NORTA Adans.

1. Norta altissima (L.) Britton. TUMBLE MUSTARD. Frequent at low altitudes, in waste ground or on open slopes. Native of Eur.; naturalized as a weed in N. Amer. (*Sisymbrium altissimum* L.)—Annual, 0.5 to 1 meter high, much branched, hairy below; leaves deeply lobed, the lobes linear or oblong; petals yellowish white, 6 to 8 mm. long; pods slender, cylindric, 7 to 10 cm. long.

10. DIPLOTAXIS DC.

1. Diplotaxis erucoides (L.) DC. Along railroad at east entrance. Native of Eur.—Annual, 30 to 60 cm. high, branched; leaves deeply lobed, the lobes oblong, toothed or lobed; petals pale yellow, 6 to mm. long; pods short-beaked.

This species is of rare occurrence in the United States, and it is not reported in any of the manuals. It seems to be fairly well established at this locality.

11. SOPHIA Adans. TANSY MUSTARD.

Annuals or biennials, the pubescence of fine branched hairs; leaves 2 or 3 times lobed, with small lobes; petals small, yellow; pods slender, cylindric or club-shaped.

Pedicels erect . . . . . **1. S. hartwegiana.**
Pedicels ascending or spreading.
  Pods somewhat club-shaped, 5 to 10 mm. long; seeds in 2 rows . **2. S. intermedia.**
  Pods linear, usually 10 to 20 mm. long; seeds in 1 row.
    Pods 15 to 20 mm. long . . . . . **3. S. parviflora.**
    Pods 10 to 15 mm. long.
      Stems densely covered with fine branched hairs, not glandular . **4. S. gracilis.**
      Stems with few or no branched hairs but with fine gland-tipped hairs. **5. S. californica.**

1. Sophia hartwegiana (Fourn.) Greene. Occasional on the east slope at low altitudes, in aspen woods or by roadsides. B. C. to Colo. and Minn.—Stems 0.4 to 1 meter high, covered with fine branched hairs; petals 2 to 3 mm. long; pods 6 to 12 mm. long, linear or club-shaped.

2. Sophia intermedia Rydb. Open banks, east entrance. B. C. to Calif., Colo., Tenn., and Mich.—Plants green, glabrate; petals scarcely longer than the sepals.

3. Sophia parviflora (Lam.) Standl. Thin woods about Belton; scarce. Native of Eur.; naturalized in N. Amer. (*S. sophia* Britton; *Sisymbrium sophia* L.; *Sisymbrium parviflorum* Lam.)—Plants 30 to 80 cm. high, grayish; petals yellowish; pods 1 mm. thick.

4. Sophia gracilis Rydb. East entrance, frequent on open slopes. Wash. to Mack. and Colo.—Leaves grayish, divided into very small, narrow lobes; petals 2 mm. long; pods 1 mm. thick.

5. Sophia californica (Torr. & Gray) Rydb. Frequent at middle altitudes and often above timber line, in woods or on open slopes. B. C. to Calif. and Mont.—Plants slender, 30 to 60 cm. high, green; petals bright yellow, 3 mm. long.

12. CONRINGIA Link.

1. Conringia orientalis (L.) Dum. HARE'S-EAR MUSTARD. Occasional at low altitudes, chiefly n waste ground. Native of Eur.; occasionally naturalized as a weed in N. Amer.—Glabrous annual, 30 to 60 cm. high; leaves mostly oval, 4 to 10 cm. long, entire, clasping, very pale; petals white, 8 mm. long; pod 4-angled, 8 to 10 cm. long, about 2 mm. thick.

13. CHEIRINIA Link. WILD WALLFLOWER.

Annuals or biennials, with leafy stems; pubescence of small, appressed, gray, 2 or 3-branched hairs; petals yellow; pods linear, somewhat 4-angled.

Petals 4 to 5 mm. long; pods 2 to 3 cm. long; plants green . . **1. C. cheiranthoides.**
Petals 8 to 10 mm. long; pods mostly 3.5 to 5 cm. long; plants grayish.
2. C. inconspicua.

1. Cheirinia cheiranthoides (L.) Link. Occasional on the east slope at low altitudes, in meadows or on open hillsides. Alaska to Utah, N. C., and Newf. (*Erysimum cheiranthoides* L.)—Plants branched, 30 to 60 cm. high; leaves linear or lanceolate, 2 to 6 cm. long, entire or shallowly toothed; petals bright yellow.

2. Cheirinia inconspicua (S. Wats.) Rydb. Frequent on the east slope at low altitudes, in meadows or on open hillsides. B. C. to Colo. and Minn.—Stems 30 to 60 cm. high, often branched; leaves mostly linear, entire or shallowly toothed; petals pale yellow.

14. CAMPE Dulac.

1. Campe orthoceras (Ledeb.) Heller. WINTERCRESS. Occasional at low and middle altitudes, in moist woods or thickets. B. C. to Colo. and Mont.; also in Eur., and naturalized in eastern N. Amer. (*C. americana* Cockerell; *Barbarea americana* Rydb.)—Plants biennial, 30 to 50 cm. high, stout, glabrous; leaves pinnately lobed, with broad rounded lobes; petals yellow, 2 to 4 mm. long; pods 2 to 3 cm. long, 2 mm. thick, somewhat 4-angled.

15. BRASSICA L. MUSTARD.

Annuals with leafy stems; leaves, at least the lower ones, lobed; petals yellow; pods long, cylindric, beaked.

Stems hairy, at least below; beak of the pod usually 10 to 15 mm. long, containing a seed in the lower part . . . . . **1. B. arvensis.**
Stems usually glabrous; beak 4 to 7 mm. long, seedless . . . . . **2. B. juncea.**

1. Brassica arvensis (L.) Kuntze. CHARLOCK. Occasional at Belton and east entrance, in waste ground. Native of Eur.; naturalized in N. Amer. (*Sinapis arvensis* L.).—Stems stout, branched, 30 to 70 cm. high; upper leaves ovate or lanceolate, toothed; petals about 8 mm. long; pods 3 to 4 cm. long.

2. Brassica juncea (L.) Coss. INDIAN MUSTARD. Occasional on the east slope at low altitudes, in waste ground. Native of Asia; naturalized in N. Amer.—Plants 0.3 to 1 meter high, branched, often glaucous; leaves mostly lobed; petals 8 to 10 mm. long; pods 3 to 5 cm. long.

16. CARDAMINE L. BITTERCRESS.

Perennials, glabrous or nearly so; leaves pinnate; petals white; pods long, narrow, flattened.

Petals usually 5 to 6 mm. long; leaflets usually 3 to 7, some of them rounded.
1. C. breweri.
Petals 2 to 3 mm. long; leaflets 5 to 15, most of them oblong or oblanceolate.
2. C. pennsylvanica.

1. Cardamine breweri S. Wats. Frequent at low and middle altitudes, in wet woods or thickets, or marshes, or along streams. B. C. to Calif Wyo., and Mont.—

Stems 20 to 50 cm. high, succulent; leaflets mostly 1 to 4 cm. wide; pods 2 to 3.5 cm. long, 1.5 mm. wide.

2. Cardamine pennsylvanica Muhl. Frequent at low altitudes, in wet woods or thickets or along streams or lakes. B. C. to Oreg., Colo., Fla., and Newf.—Stems 15 to 40 cm. high, branched; leaflets mostly less than 1 cm. wide, often lobed or toothed; pods 2 to 3 cm. long, 1 mm. wide.

17. DRABA L. Whitlowgrass.

Annuals or perennials, the pubescence, if any, mostly of branched hairs; leaves entire or toothed, often all basal; petals white or yellow; pods short, linear or oblong, flat.

Plants annuals or winter annuals; style none.
  Pods finely hairy.
    Pedicels equaling or longer than the pods; stems leafy . . . . . **1. D. nemorosa.**
    Pedicels shorter than the pods; stems naked or with few small leaves. **2. D. praealta.**
  Pods glabrous.
    Stems leafy; pods usually 8 to 15 mm. long . . . . . **3. D. nitida.**
    Stems naked; pods mostly 6 to 8 mm. long . . . . . **4. D. crassifolia.**
Plants perennial; style present except in one species.
  Stems leafy; plants usually 15 to 40 cm. high.
    Petals white . . . . . **5. D. cana.**
    Petals yellow . . . . . **6. D. aurea.**
  Stems naked; stems usually less than 10 cm. high.
    Pods densely hairy.
      Pods nearly or fully twice as long as wide . . . . . **7. D. densifolia.**
      Pods nearly as wide as long . . . . . **8. D. andina.**
    Pods glabrous or with a few hairs near the margins.
      Pods nearly as wide as long . . . . . **9. D. oligosperma.**
      Pods twice as long as wide or longer.
        Style none . . . . . **10. D. fladnizensis.**
        Style present.
          Petals yellow . . . . . **11. D. glacialis.**
          Petals white.
            Pods twisted; leaves with fine branched hairs . . . **12. D. lonchocarpa.**
            Pods not twisted; leaves with unbranched hairs on the margins. **13. D. oreibata.**

1. Draba nemorosa L. Moist woods below Lake McDermott. B. C. to Oreg., Nev., Colo., and Mich.; also in Eur. and Asia.—Stems slender, 10 to 30 cm. high; leaves ovate or oblong, usually toothed; petals pale yellow, 2 to 3 mm. long; pods 7 to 15 mm. long, 2 mm. wide.

2. Draba praealta Greene. Rocky slopes near or above timber line. B. C. and Alta. to Wyo.—Stems slender, 10 to 20 cm. high; basal leaves lanceolate or oblanceolate, with fine branched hairs, 1 to 3 cm. long; petals white, 2 to 3 mm. long; pods 1 cm. long, 2 to 3 mm. wide.

3. Draba nitida Greene. Frequent on the east slope at middle altitudes, in moist woods or on open banks. Alta. and B. C. to Calif. and Colo.—Stems slender, 10 to 30 cm. high; basal leaves oblanceolate, 1 to 3 cm. long, hairy beneath; petals yellow, 2 mm. long; pods 2 mm. wide.

4. Draba crassifolia Graham. Frequent above timber line, in meadows or on rocky slopes. Alaska to Colo., Lab., and Greenl.—Stems slender, 2 to 12 cm. high; basal leaves oblanceolate, 5 to 15 mm. long; petals 2 mm. long, pale yellow or nearly white; pods 2 mm. wide.

5. Draba cana Rydb. Frequent on the east slope at low and middle altitudes and sometimes above timber line, in woods or on open hillsides. B. C. and Alta. to N. Mex.—Stems stout, branched, at least at the base, finely hairy; leaves mostly lanceolate or ovate; petals 3 mm. long; pods 6 to 8 mm. long, finely hairy, usually twisted.

6. Draba aurea Vahl. Frequent on the east slope at middle altitudes and sometimes above timber line, in woods or on open hillsides. Alaska to Ariz., Lab., and Greenl.; also in Eur.—Stems stout, finely hairy; basal leaves oblanceolate, 1 to 2 cm. long; petals 3 to 5 mm. long; pods 10 to 12 mm. long, 2 to 3 mm. wide, finely hairy, usually twisted.

7. Draba densifolia Nutt. Occasional above timber line, chiefly on rock slides. Alaska to Wyo.—Plants densely tufted; leaves oblanceolate, 5 to 10 mm. long, hairy, crowded and overlapping; stems 1 to 5 cm. high; petals yellow, 4 to 5 mm. long; pods 5 to 8 mm. long, 3 to 4 mm. wide.

8. Draba andina (Nutt.) A. Nels. Occasional above timber line, on rock slides or exposed summits, sometimes about snow banks at middle altitudes. B. C. and Alta. to Wyo. and Utah.—Plants very densely tufted; leaves 5 mm. long, hairy, densely crowded and overlapping; stems 1 to 3 cm. high; petals yellow, 4 to 5 mm. long; pods 3 to 4 mm. long, 2.5 to 3 mm. wide.

9. Draba oligosperma Hook. Hills at east entrance, *Umbach*. Alaska to Calif. and Utah.—Plants densely tufted; leaves linear, 5 to 10 mm. long, crowded; stems 2 to 8 cm. high; petals pale yellow, 4 to 5 mm. long; pods about 4 mm. long and 3 mm. wide.

10. Draba fladnizensis Wulf. Open rocky slope at Gunsight Pass. Alaska to Colo., Que., and Greenl.; also in Eur.—Stems slender, 5 to 12 cm. high; leaves oblanceolate, 1 cm. long or shorter, nearly glabrous; petals white, 3 mm. long; pods 4 to 6 mm. long, 2 mm. wide.

11. Draba glacialis Adams. Occasional above timber line, on cliffs or open rocky slopes. Alaska to Wyo. and Greenl.—Stems 5 to 15 cm. high, densely tufted; leaves mostly linear, 1 to 3 cm. long, finely hairy; petals yellow, 5 mm. long; pods 6 to 10 mm. long, 2 to 3 mm. wide.

12. Draba lonchocarpa Rydb. Occasional above timber line, on moraines and rock slides. B. C., Wash., Mont., and Alta.—Plants slender, tufted, 5 to 10 cm. high; leaves spatulate, 3 to 10 mm. long; petals white, 2 mm. long; pods 8 to 12 mm. long, 1.5 mm. wide.

13. Draba oreibata Macbr. & Payson. Occasional on open rocky slopes about timber line, or in exposed places at lower altitudes. Idaho, Utah, and Mont.—Plants tufted, 3 to 10 cm. high; leaves narrowly oblong, 4 to 10 mm. long; petals white, 2 to 3 mm. long; pods 7 to 10 mm. long, 2 to 3 mm. wide.

18. ARABIS L. Rockcress.

Perennials or biennials, glabrous or hairy, the hairs usually branched; leaves entire or toothed, rarely lobed; petals white, pink, or purple; pods long, linear, flat.

Basal leaves deeply lobed . . . . . **1. A. ambigua.**
Basal leaves entire or toothed.
Pods spreading or reflexed.
Pedicels abruptly reflexed.
Pods nearly 2 mm. wide; petals 6 to 8 mm. long; stem leaves oblong or lanceolate . . . . . **2. A. retrofracta.**
Pods less than 1.5 mm. wide; petals 5 to 6 mm. long; stem leaves linear.
3. A. lignipes.

Pedicels spreading or ascending.
Pods 3 to 4 cm. long; plants usually 10 to 20 cm. high . . . . **4. A. lemmonii.**
Pods 4 to 8 cm. long; plants usually 30 to 50 cm. high . . . . . **5. A. bourgovii.**
Pods erect or strongly ascending.
Basal leaves glabrous or nearly so.
Stems 30 to 60 cm. high; pods 5 to 8 cm. long . . . . . **6. A. drummondii.**
Stems usually 10 to 20 cm. high; pods 4 to 5 cm. long . . . . . **7. A. lyallii.**
Basal leaves covered with coarse hairs.
Stem leaves narrowed at the base; plants 10 to 20 cm. high . . **8. A. nuttallii.**
Stem leaves clasping; plants mostly 30 to 60 cm. high.
Pods about 1 mm. wide, flat; leaves green, the stem leaves usually toothed. **9. A. hirsuta.**
Pods 2 mm. wide, somewhat 4-angled; leaves somewhat glaucous, the stem leaves usually entire . . . . . **10. A. glabra.**

1. Arabis ambigua DC. Rock slide above Many Glacier Hotel. Alaska to Wash. and Mont.—Stems tufted, 15 to 30 cm. high, slender, glabrous or nearly so; stem leaves spatulate or oblanceolate, entire or toothed; petals white, 6 mm. long; pods erect, 2 to 3 cm. long.

2. Arabis retrofracta Graham. Thin woods at base of Altyn Peak. B. C. to Calif., Utah, and Nebr.—Stems 20 to 40 cm. high, with branched hairs; stem leaves clasping, entire, glabrous; petals white or pinkish.

3. Arabis lignipes A. Nels. Dry rocky slopes, Altyn Peak. Idaho, Mont., and Wyo.—Stems 30 to 50 cm. high, finely hairy below; stem leaves finely hairy, clasping; petals white or purplish.

4. Arabis lemmonii S. Wats. GRAY ROCKCRESS. Common above timber line, in meadows or on rock slides; sometimes about snow banks at middle elevations; also on exposed slopes at east entrance. B. C. to Calif. and Mont.—Stems slender, usually several; stem leaves lanceolate or oblong, clasping, the basal leaves covered with fine branched gray hairs; petals purple, 5 to 6 mm. long.

5. Arabis bourgovii Rydb. Frequent on the east slope at low and middle altitudes and sometimes near timber line, in meadows or low thickets or on open rocky hillsides. Alaska to Man., Wyo., and Idaho.—Stems slender, often numerous; basal leaves oblanceolate, finely hairy; stem leaves lanceolate, clasping; petals pink, 6 to 8 mm. long; pods 2 mm. wide.

6. Arabis drummondii A. Gray. Frequent at nearly all altitudes, but most common above timber line, in woods or meadows or on rock slides or open slopes. Yukon to Utah and N. Mex.—Stems several or solitary; stem leaves lanceolate, clasping, glabrous, glaucous, entire; petals 6 to 10 mm. long, varying from white to purple; pods 1.5 to 2 mm. wide.

7. Arabis lyallii S. Wats. PURPLE ROCKCRESS. Common above timber line, in meadows and on rock slides. B. C. to Calif. and Mont.—Stems usually clustered, glabrous; stem leaves lanceolate, usually clasping, green, entire, glabrous; petals purple, 7 to 8 mm. long; pods 2 mm. wide.

A showy and handsome plant, which remains in flower only a short time.

8. Arabis nuttallii Robinson. Frequent at nearly all altitudes, but most common above timber line, in meadows or woods or on open slopes or rock slides. Wash. to Utah and Mont.—Stems clustered, slender, hairy below; petals white, 4 to 6 mm. long; pods 1 to 3 cm. long.

9. Arabis hirsuta (L.) Scop. Frequent on the east slope at low or middle altitudes, in woods, thickets, or meadows or on open hillsides. Alaska to Calif., Ga., and N. B.; also in Eur. (*A. ovata* Poir.)—Stems solitary or few, stout, often purplish, hairy;

stem leaves lanceolate or oblong, clasping, 2 to 6 cm. long; petals white, 4 to 5 mm. long; pods 4 to 6 cm. long, erect.

10. Arabis glabra (L.) Bernh. East entrance and Belton, in thickets or on open slopes. Alaska to Calif., Pa., and Que.; also in Eur. (*Turritis glabra* L.)—Stems stout, hairy below; stem leaves lanceolate or ovate, 2 to 12 cm. long, glabrous, clasping; petals white, 3 mm. long; pods erect, 4 to 10 cm. long.

36. CAPPARIDACEAE. Caper Family.

1. CLEOME L.

1. Cleome serrulata Pursh. ROCKY MOUNTAIN BEEPLANT. Along the railroad near the east entrance; apparently introduced; abundant farther east on the plains. Oreg. to Sask., N. Mex., and Ariz. (*Peritoma serrulatum* DC.)—Glabrous annual, 0.5 to 1 meter high; leaves palmate, stalked; leaflets 3, entire, oblanceolate; flowers purple; petals 4, about 1 cm. long; fruit a long slender stalked pod.

The plant has a disagreeable odor; its flowers are showy.

37. DROSERACEAE. Sundew Family.

1. DROSERA L.

Small perennials; leaves in a basal rosette, entire, stalked, covered with slender gland-tipped hairs; flowers small, white, in a raceme; petals usually 5.—The sundews are of great interest because of their carnivorous habits. The glands of the leaves exude a sticky fluid, by which insects are entrapped, to be digested and used as food by the plants.

Leaves rounded, as broad as long . . . . . **1. D. rotundifolia.**
Leaves oblanceolate, several times longer than broad . . . . . **2. D. longifolia.**

1. Drosera rotundifolia L. COMMON SUNDEW. Sphagnum bogs at Johns and Fish lakes, and doubtless in similar places elsewhere. Alaska to Calif., N. J., and Lab.; also in Eur. and Asia.—Leaves 6 to 10 mm. wide; stems 6 to 20 cm. high; petals 4 mm. long; capsules 5 mm. long.

The plants are not at all conspicuous and are half hidden in the sphagnum. The leaves and stems are more or less tinged with red.

2. Drosera longifolia L. NARROWLEAF SUNDEW. Abundant in sphagnum bog about Fish Lake. B. C. to Calif., Ont., and Newf.; also in Eur. and Asia.—Leaves 1.5 to 3 cm. long, 4 to 5 mm. wide; stems 5 to 20 cm. high; petals 5 mm. long.

38. CRASSULACEAE. Stonecrop Family.

1. SEDUM L. STONECROP.

Perennial herbs with leafy stems; leaves narrow, fleshy, entire or toothed; flowers in cymes; sepals 4 or 5; petals 4 or 5; stamens 8 or 10; fruit of 4 or 5 small pods.

Petals dark purple . . . . . **1. S. integrifolium.**
Petals bright yellow.
Leaves terete or nearly so, narrow at the base; plants without bulblets. **2. S. stenopetalum.**
Leaves flattened, broadened at the base; flowers partly replaced by small plants or bulblets . . . . . **3. S. douglasii.**

1. Sedum integrifolium (Raf.) A. Nels. RED ORPINE. Common above or near timber line, on open rocky slopes. Alaska to Calif. and Colo. (*Rhodiola integrifolia* Raf.)—Stems clustered, very stout, about 10 cm. high; leaves obovate or oblong, 1 to 1.5 cm. long, sometimes toothed; petals about 3 mm. long.

A rather showy plant, especially in late summer, when the pods and leaves are usually red or purple.

2. Sedum stenopetalum Pursh. YELLOW STONECROP. At nearly all altitudes, but most common above timber line, on open rocky slopes. Alta. to Calif., N. Mex., and Nebr.—Stems 6 to 15 cm. high, tufted; leaves mostly basal, linear, 6 to 12 mm. long; petals linear-lanceolate, 6 to 7 mm. long; pods 4 mm. long.

A handsome plant, which remains in flower a long time.

3. Sedum douglasii Hook. Frequent at low and middle altitudes, on open rocky slopes. B. C. to Calif. and Mont.—Stems 10 to 20 cm. high; leaves linear-lanceolate, 1 to 2 cm. long; petals 6 to 10 mm. long; pods 3 to 4 mm. long.

Nearly all the flowers are replaced by diminutive plants or bulblets, which fall from the stems if touched, and presumably develop into new plants.

39. PARNASSIACEAE. Parnassia Family.

1. PARNASSIA L.

Glabrous erect perennials; leaves clustered at the base of the plant, the flower stems 1-flowered, naked or with a single bract; flowers white; petals 5, conspicuously veined; stamens 5, with a fascicle of sterile stamens between each pair; fruit a 1-celled capsule.

Petals fringed on the sides toward the base . . . . . **1. P. fimbriata.**
Petals not fringed.
  Petals scarcely as long as the sepals, 3-veined; capsule twice as long as the sepals; bract none or borne near the base of the stem . . . . . **2. P. kotzebuei.**
  Petals longer than the sepals, often much longer, 5 to 9-veined; capsule less than twice as long as the sepals; bract present, borne near the middle of the stem.
    Petals nearly twice as long as the sepals; sterile stamens usually 9 to 15 in each fascicle . . . . . **3. P. palustris.**
    Petals only slightly longer than the sepals; stamens usually 7 to 9 in each fascicle . . . . . **4. P. montanensis.**

1. Parnassia fimbriata Konig. FRINGED PARNASSIA. Common at all altitudes except the very highest, along streams, in bogs, or in wet meadows. Alaska to Calif., N. Mex., and Alta.—Plants usually in dense clumps, 20 to 40 cm. high; leaves kidney-shaped, 2 to 4 cm. wide; petals about 8 mm. long.

The flowers are very showy and graceful. Above timber line the petals are often only 6 mm. long.

2. Parnassia kotzebuei Cham. ALPINE PARNASSIA. Edge of a brook at Grinnell Glacier; high rock slide above Lake McDermott. Alaska to Wyo., Que., and Greenl.—Leaves broadly ovate or somewhat heart-shaped, 1 to 2 cm. long; stems about 10 cm. high; petals about 5 mm. long.

3. Parnassia palustris L. MEADOW PARNASSIA. In a wet thicket at St. Mary. Alaska to Wyo., Que., and Lab.; also in Eur. and Asia.—Leaves heart-shaped, 1 to 3 cm. wide; stems 10 to 30 cm. high; petals 8 to 12 mm. long.

4. Parnassia montanensis Fern. & Rydb. MONTANA PARNASSIA. Edge of creek near east entrance; open bog below Lake McDermott. B. C. to Sask. and Mont.—Leaves heart-shaped or kidney-shaped, 1 to 2 cm. wide; stems 15 to 20 cm. high; petals 8 to 10 mm. long.

40. SAXIFRAGACEAE. Saxifrage Family.

Perennial herbs; leaves usually alternate, often all borne at the base of the stem, simple or compound; sepals 5; petals 5 or none, small; stamens as many or twice as many as the sepals; fruit a capsule or of 2 or more small pods.

Flowers in loose racemes; petals lobed.
  Leaves divided to the base; rootstocks with bulblets . . . **1. LITHOPHRAGMA.**
  Leaves shallowly lobed; rootstocks without bulblets . . . . . **2. MITELLA.**

Flowers not in racemes; petals entire.
  Stamens 5.
    Lowest leaves divided to the base into 3 lobes . . . . . **3. HEMIEVA.**
    Lowest leaves (like the upper ones) shallowly lobed or toothed.
      Rootstocks with bulblets; flower stems leafy; flowers in a loose open panicle. **4. SUKSDORFIA.**
      Rootstocks without bulblets; flower stems not leafy; flowers in a dense spike-like panicle . . . . . **5. HEUCHERA.**
  Stamens 10.
    Fruit 1-celled; leaves broadly heart-shaped; flowers white, in a loose panicle. **6. TIARELLA.**
    Fruit 2-celled; leaves and flowers various.
      Leaves leathery; fruit of 2 distinct pods . . . . . **7. LEPTARRHENA.**
      Leaves thin or fleshy, not leathery; fruit of 2 united pods . **8. SAXIFRAGA.**

1. LITHOPHRAGMA Nutt.

1. Lithophragma parviflora (Hook.) Nutt. WOODLAND STAR. East entrance, in woods, *Umbach*. B. C. to Calif., Colo., and S. Dak.—Stems slender, 10 to 30 cm. high, leafy, somewhat hairy; lobes of the leaves again lobed, 1 to 3 cm. long; flowers few, the petals white, 7 to 8 mm. long, 3 or 5-cleft; stamens 10.

2. MITELLA L. MITERWORT.

Perennials with rootstocks; leaves basal, long-petioled, heart-shaped or kidney-shaped, shallowly toothed and lobed; petals 5 or none; stamens 5 or 10.—The capsule opens widely and exposes the black seeds which lie within, like eggs in a nest.

Petals 3-cleft near the apex, white or purplish; stamens 5, opposite the sepals. **1. M. violacea.**
Petals pinnately lobed, greenish or yellowish; stamens 5 or 10.
  Stamens 10; rootstocks very slender . . . . . **2. M. nuda.**
  Stamens 5; rootstocks short and thick.
    Stamens opposite the petals . . . . . **3. M. pentandra.**
    Stamens opposite the sepals . . . . . **4. M. breweri.**

1. Mitella violacea Rydb. Occasional on the east slope at all altitudes, on open slopes or cliffs or in moist woods. Mont. (*Ozomelis violacea* Rydb.)—Rootstocks thick; leaves 2 to 4 cm. long, shallowly lobed, hairy; flower stems slender, 10 to 30 cm. high; petals twice as long as the sepals.

2. Mitella nuda L. Mossy banks in swampy woods below Lake McDermott. B. C. and Mont. to Lab.; also in Asia.—Plants producing long runners; leaves 2 to 5 cm. wide, only slightly lobed, hairy; stems 5 to 20 cm. high.

3. Mitella pentandra Hook. Common at middle and high altitudes, on open slopes or in meadows or deep woods. Alaska to Calif., Colo., and Alta. (*Pectianthia pentandra* Rydb.)—Leaves 3 to 8 cm. wide, very shallowly lobed, sparsely short-hairy; stems 10 to 40 cm. high; petals with threadlike lobes.

4. Mitella breweri A. Gray. Common above and near timber line, in woods or on open slopes. B. C. to Calif., Mont., and Alta. (*Pectianthia breweri* Rydb.)—Leaves 4 to 7 cm. wide, shallowly lobed, slightly hairy; stems 10 to 30 cm. high; flowers green.

3. HEMIEVA Raf.

1. Hemieva ranunculifolia (Hook.) Raf. On moist cliffs or damp rocky slopes; Altyn Peak, Grinnell Glacier, Baring Falls. B. C. to Oreg., Mont., and Alta.—Plants with bulblike rootstocks, 10 to 20 cm. high, with scattered gland-tipped hairs; basal leaves stalked, 1 to 2.5 cm. long, divided to the base into 3 broad lobes, these 3 or 4-lobed; upper leaves 3-lobed; flowers in a loose panicle; petals white, short-clawed, persisting in fruit.

4. SUKSDORFIA A. Gray.

1. Suksdorfia violacea A. Gray. Wet mossy cliffs at Baring Falls. Wash. and Oreg. to Mont.—Plants 10 to 20 cm. high, with bulblet-bearing rootstocks, somewhat glandular-hairy; lower leaves kidney-shaped, 1 to 3 cm. wide, with rounded teeth; upper leaves 2 to 4-toothed at the tip; flowers few, panicled; petals pink, 5 to 7 mm. long, clawed.

5. HEUCHERA L. Alumroot.

Perennials with thick rootstocks; leaves basal, slender-petioled, rounded or kidney-shaped, shallowly or deeply lobed; flowers in spikelike panicles, on naked stalks; petals entire; stamens 5, opposite the sepals; capsule 2-beaked.

Flowers 3 to 4 mm. long; leaves lobed nearly halfway to the base. **1. H. flabellifolia.**

Flowers about 7 mm. long; leaves shallowly lobed . . . . . **2. H. glabella.**

1. Heuchera flabellifolia Rydb. Hills at east entrance, and on Mt. Henry, *Umbach.* Alta. to Wyo.—Stems 20 to 30 cm. high, finely glandular-hairy; leaves 1.5 to 3 cm. wide, glandular; flowers greenish.

2. Heuchera glabella Torr. & Gray. Common at nearly all altitudes, usually on cliffs or rocks, sometimes on open slopes, in dry woods or alpine meadows, or on prairie. Wash. and Oreg. to Mont. and Alta.—Leaves long-stalked, rounded or heart-shaped, 2 to 5 cm. wide, glabrous or nearly so, with shallow lobes and teeth; flower stalk 20 to 50 cm. high, nearly glabrous; flowers yellowish white.

In dry weather or in late summer the leaves turn bronze or deep red. The flowers are rather handsome. The Blackfoot Indians used the macerated plant as a remedy for sores and swellings.

6. TIARELLA L.

1. Tiarella unifoliata Hook. Laceflower. Common or abundant at middle altitudes, in moist woods; sometimes at low altitudes and in meadows above timber line. B. C. to Calif. and Mont.—Perennial with thick rootstocks; stems 15 to 40 cm. high, glabrous or nearly so, with 1 to 4 leaves; basal leaves slender-petioled, broadly heart-shaped, 4 to 10 cm. long, 3 or 5-lobed and toothed, finely hairy; flowers white, in narrow panicles; stamens 10, longer than the petals.

One of the most conspicuous plants of moist woods, forming dense banks all along the trails. The flowers are very delicate and give the effect of a cloud of mist above the masses of deep green leaves; they last almost all summer.

7. LEPTARRHENA R. Br.

1. Leptarrhena pyrolifolia (Don) R. Br. Leatherleaf saxifrage. Abundant above timber line, in wet meadows or on rocky slopes, often along brooks. Alaska to Wash. and Mont.—Plants 10 to 20 cm. high, from a short thick leafy base; leaves mostly at base of stem, oblong, 3 to 8 cm. long, thick and leathery, toothed, deep green and shining on the upper surface, pale beneath; flower stalk bearing 1 or 2 leaves, the flowers in a narrow panicle; petals white, 2 to 2.5 mm. long, persisting in fruit.

A handsome plant, often forming great mats. The fruit is tinged with red or purple.

8. SAXIFRAGA L. Saxifrage.

Perennials with naked or leafy stems; leaves entire, toothed, or lobed; flowers mostly in cymes, sometimes solitary; petals entire; stamens 10; fruit 2-celled.

Leaves entire.

Leaves opposite, obtuse; flowers solitary, purple . . . . . **1. S. oppositifolia.**

Leaves alternate, acute; flowers in cymes, white . . . . . **2. S. bronchialis.**

Leaves toothed or lobed.
Stems leafy.
Leaves longer than broad, 3-toothed or with 3 narrow lobes.
Basal leaves entire or 3-toothed . . . . . **3. S. adscendens.**
Basal leaves deeply 3-lobed . . . . . **4. S. caespitosa.**
Leaves as broad as long or broader, with 3 or more broad lobes.
Flowers, except the uppermost one, replaced by bulblets; stems finely and densely viscid-hairy . . . . . **5. S. cernua.**
Flowers not replaced by bulblets; stems nearly glabrous . . . . **6. S. rivularis.**
Stems naked.
Leaves and petioles glabrous.
Leaves as broad as long or broader, somewhat cordate at base . . . **7. S. arguta.**
Leaves mostly longer than broad, narrowed at base . . . . . **8. S. lyallii.**
Leaves and petioles finely or coarsely hairy.
Leaves kidney-shaped, as broad as long, deeply cordate at base.
9. S. mertensiana.
Leaves oblong, ovate, or spatulate, longer than broad, narrowed at base.
Flowers nearly sessile, in dense clusters, the inflorescence without bulblets.
10. S. rhomboidea.
Flowers slender-stalked, in loose cymes, often replaced by bulblets.
11. S. brunoniana.

1. Saxifraga oppositifolia L. PURPLE SAXIFRAGE. On moraine at Grinnell Glacier. Alaska to Wyo., Vt., and Greenl.; also in Eur. and Asia. (*Antiphylla oppositifolia* Fourr.)—Plants with leafy stems, forming dense mats; leaves obovate or spatulate, 3 to 5 mm. long, densely crowded, hairy on the margins; flower stalks 1 to 3 cm. long, 1-flowered; petals 8 to 9 mm. long.

Very showy when in flower.

2. Saxifraga bronchialis L. COMMON SAXIFRAGE. Common at nearly all altitudes, on open slopes or rock slides, sometimes even on prairie. Alaska to N. Mex.; also in Eur. and Asia. (*S. austromontana* Wiegand; *Leptasea austromontana* Small.)—Plants 5 to 15 cm. high, forming dense mats; leaves lanceolate, 5 to 12 mm. long, spine-tipped, hairy on the margins, crowded and overlapping; petals about 5 mm. long, white, with dark red dots.

In dry places the leaves are often purplish; they are disagreeably prickly.

3. Saxifraga adscendens L. Frequent above timber line, on rocky slopes. B. C. and Alta. to Colo.; also in Eur. (*Muscaria adscendens* Small.)—Plants 3 to 10 cm. high, not tufted, very viscid; leaves mostly basal, 4 to 10 mm. long, wedge-shaped; petals 3 mm. long, white.

An inconspicuous plant, easily overlooked.

4. Saxifraga caespitosa L. Frequent above timber line, on rock slides or moist cliffs. Alaska to Colo., Que., and Greenl.; also in Eur. (*Muscaria caespitosa* Haw.)—Plants 2 to 10 cm. high, often matted, finely glandular-hairy; leaves 5 to 15 mm. long; flower stalks 1 to 3-flowered; petals 3 to 5 mm. long, white.

5. Saxifraga cernua L. Occasional on alpine rock slides. Alaska to N. Mex., Lab., and Greenl.; also in Eur. and Asia.—Stems usually solitary, erect, 8 to 15 cm. high; leaves kidney-shaped, 1 to 2 cm. wide, shallowly 5 or 7-lobed; petals white, 6 to 8 mm. long.

6. Saxifraga rivularis L. Occasional above timber line, in meadows or on moist cliffs. Alaska to Wyo., N. H., and Greenl.; also in Eur. and Asia.—Plants 2 to 10 cm. high, very slender, loosely matted; basal leaves long-petioled, kidney-shaped, 4 to 10 mm. broad, with 3 or 5 broad lobes; petals white, 3 to 5 mm. long.

Specimens from Sperry Glacier, reported as *S. debilis* Engelm., a closely related species, are *Romanzoffia sitchensis* Bong.

7. Saxifraga arguta Don. Occasional at low altitudes, on shady mossy banks. B. C. and Mont. to N. Mex. and Calif. (*Micranthes arguta* Small.)—Stems 20 to 40 cm. high, glabrous or nearly so, loosely branched above; leaves long-petioled, rounded or kidney-shaped, 3 to 8 cm. wide, coarsely toothed; petals 3 mm. long, white, with 2 yellow spots below the middle.

8. Saxifraga lyallii Engl. REDSTEM SAXIFRAGE. Common above timber line, in meadows or on rock slides. Alaska to Mont. (*Micranthes lyallii* Small.)—Stems 10 to 25 cm. high, usually purple or red, glabrous; leaves fan-shaped, 2 to 4 cm. long, coarsely toothed; cymes open and loosely flowered; petals 3 to 4 mm. long, white, with 2 yellow spots below the middle.

In wet alpine meadows, especially along brooks, this saxifrage is often abundant and forms dense carpets. The purplish stems and bright green leaves are most attractive.

9. Saxifraga mertensiana Bong. Frequent above or near timber line, on wet cliffs; sometimes on cliffs at middle altitudes. Alaska to Calif. and Mont. (*Heterisia mertensiana* Small.)—Plants 10 to 30 cm. high, brittle, loosely hairy; leaves 2 to 6 cm. wide, shallowly lobed, the lobes 3-toothed; inflorescence loosely branched, often with bulblets; petals white, 3 to 4 mm. long.

10. Saxifraga rhomboidea Greene. Frequent above timber line, in meadows or on rocky slopes; sometimes about snow banks at middle altitudes. Mont. to N. Mex. (*Micranthes rhomboidea* Small.)—Stems 10 to 25 cm. high; leaves in a basal rosette, oblong or ovate, 2 to 6 cm. long, with low obtuse teeth, the petioles short and winged; petals 3 to 4 mm. long, white.

11. Saxifraga brunoniana Bong. Frequent above or near timber line, on cliffs or open slopes; sometimes on cliffs at middle altitudes. Alaska to Oreg. and Colo. (*Spatularia brunoniana* Small; *S. vreelandii* Small.)—Plants 10 to 40 cm. high, very viscid; leaves spatulate, 2 to 8 cm. long, toothed; flowers mostly replaced by green bulblets; petals white, 3.5 to 5 mm. long.

41. GROSSULARIACEAE. Gooseberry Family.

Fruit black, with gland-tipped hairs; pedicels jointed below the flowers . **1. RIBES.**
Fruit wine-red, glabrous; pedicels not jointed . . . . . **2. GROSSULARIA.**

1. RIBES L.

Plants spiny or unarmed; leaves alternate, broad; flowers in racemes; sepals and petals each 5; stamens 5; fruit a juicy berry.—The cultivated currants belong to this genus.

Plants without spines or bristles; stems and leaves covered with fine sticky hairs.
1. R. viscosissimum.

Plants usually with spines or bristles or both; stems and leaves not viscid-hairy.
2. R. lacustre.

1. Ribes viscosissimum Pursh. STICKY CURRANT. Frequent at low and middle altitudes, usually in thin woods. B. C. to Calif., Colo., and Mont.—Shrub, a meter high or less; leaves rounded, kidney-shaped, 5 to 8 cm. wide, shallowly lobed; flowers few, greenish, about 14 mm. long; fruit covered with short gland-tipped hairs.

This shrub is nowhere abundant, and usually only one or two plants are found in a place. The leaves are so sticky that it is unpleasant to handle them, and they catch and hold dust.

2. Ribes lacustre (Pers.) Poir. SPINY CURRANT. PLATE 49, B. Common up to timber line, usually in woods or along cliffs. Alaska to Calif., N. Mex., Pa., and Newf. (*Limnobotrya lacustris* Rydb.; *Ribes lacustre parvulum* A. Gray.)—Shrub, 0.6 to 1.5 meters high, very spiny and prickly; leaves glabrous, 2 to 5 cm. long, with obtuse lobes, often shining; flowers greenish or purplish.

Abundant in many places; a characteristic shrub about alpine meadows. The fruit is sour and somewhat bitter. The flowers last a long time.

2. GROSSULARIA Mill.

1. Grossularia inermis (Rydb.) Coville & Britton. WILD GOOSEBERRY. Common in woods and thickets at low and middle altitudes; often associated with aspens. B. C. and Alta. to N. Mex. and Calif. (*Ribes inerme* Rydb.)—Shrub, a meter high or less, with few or no spines; leaves glabrous, lobed; flowers 5 to 6 mm. long, greenish and inconspicuous; sepals and petals each 5; stamens 5.

The fruit, which is borne in abundance, is of good flavor when ripe. Wild gooseberries are very abundant in the thickets along Swiftcurrent Creek below Lake McDermott.

42. ROSACEAE. Rose Family.

Herbs or shrubs; leaves simple or compound, alternate, usually with stipules; sepals usually 5; petals as many as the sepals; stamens usually many, most commonly 20; fruit dry or fleshy.

Leaves simple, toothed or lobed; plants with woody stems.
- Plants prostrate, forming mats; petals 8 to 10; fruit of achenes with long hairy tails . . . . . **6. DRYAS.**
- Plants erect shrubs; petals 5; fruit not of tailed achenes.
  - Leaves large, 10 to 20 cm. broad; fruit like a raspberry . . . . . **11. RUBUS.**
  - Leaves small, much less than 10 cm. broad; fruit dry.
    - Flowers in pointed panicles; fruit of small achenes . . . **3. SERICOTHECA.**
    - Flowers in flat-topped corymbs; fruit of small pods.
      - Leaves lobed; fruit of 2 pods . . . . . **1. OPULASTER.**
      - Leaves toothed but not lobed; fruit usually of 5 pods . . . . **2. SPIRAEA.**

Leaves compound, composed of 3 or more leaflets.
- Plants shrubby, sometimes armed with prickles or bristles.
  - Plants neither prickly nor bristly; flowers yellow . . . . . **4. POTENTILLA.**
  - Plants prickly or bristly or both; flowers white or pink.
    - Flowers white; fruit like a raspberry or blackberry . . . . . **11. RUBUS.**
    - Flowers pink; fruit red, smooth outside, open at the top, containing numerous seedlike achenes on the inside . . . . . **12. ROSA.**

Plants herbaceous, unarmed.
- Leaflets 3 or 5, all attached at the end of the leaf stalk.
  - Plants with runners or long creeping stems; petals white; fruit juicy.
    - Leaflets 3; fruit red and fleshy, bearing the seedlike achenes on the outside . . . . . **6. FRAGARIA.**
    - Leaflets 5; fruit of a few small distinct 1-seeded drupes . . . . **11. RUBUS.**
  - Plants without runners; petals yellow; fruit dry.
    - Stamens 5; petals shorter than the sepals; plants 10 cm. high or smaller. **7. SIBBALDIA.**
    - Stamens usually 20; petals commonly much longer than the sepals; plants usually much more than 10 cm. high . . . . . **4. POTENTILLA.**
- Leaflets 5 or usually more, some of them attached along the side of the leaf stalk.
  - Achenes tailed or beaked in age.
    - Achenes with hooked beaks . . . . . **9. GEUM.**
    - Achenes with slender hairy tails . . . . . **10. SIEVERSIA.**
  - Achenes neither tailed nor beaked.
    - Style borne near the top of the achene; petals bright yellow or rarely purple; plants not sticky . . . . . **4. POTENTILLA.**
    - Style borne near the base of the achene; petals pale yellow or nearly white; plants with fine sticky hairs . . . . . **5. DRYMOCALLIS.**

1. **OPULASTER** Medic.

1. Opulaster malvaceus (Greene) Kuntze. NINEBARK. Belton, in woods or on open rocky slopes. B. C. to Oreg., Utah, and Mont. (*Physocarpus malvaceus* Kuntze.)—Shrub, about a meter high, with loose shredded bark; leaves 2 to 6 cm. wide, stalked, rounded, 3 or 5-lobed and with rounded teeth, glabrous or with branched hairs; flowers white, in dense flat-topped clusters; petals about 5 mm. long; fruit of 2 pods about 5 mm. long.

A handsome shrub when in flower.

2. **SPIRAEA** L.

Shrubs with toothed leaves; flowers in flat-topped panicles, small; fruit of 5 small pods.

Flowers deep reddish pink . . . . . **1. S. densiflora.**
Flowers white . . . . . **2. S. lucida.**

1. Spiraea densiflora Nutt. PINK MEADOWSWEET. Common just above timber line in wet meadows or on open slopes, also in open or brushy places at middle altitudes. B. C. to Oreg., Wyo., and Mont.—Slender shrub, 0.5 to 1.5 meters high, with reddish brown branches; leaves oval or oblong, 1.5 to 3 cm. long, bright green, toothed above the middle, glabrous or nearly so; panicles narrow, dense; petals 1.5 mm. long.

A showy shrub, with very sweet-scented flowers, which last only a short time. Their fragrance is often noticeable before the plants themselves are seen.

2. Spiraea lucida Dougl. WHITE MEADOWSWEET. Common at low and middle altitudes, among aspens, in thin woods, or on open slopes, sometimes extending up to or even above timber line. B. C. to Oreg., Wyo., and Sask.—Low shrub, 30 to 60 cm. high, with creeping rootstocks; leaves oval or obovate, 2 to 6 cm. long, glabrous, rather pale, coarsely toothed; petals 2 mm. long.

The flowers are nearly odorless; they last a long time.

3. **SERICOTHECA** Raf.

1. Sericotheca discolor (Pursh) Rydb. MOUNTAIN-SPRAY. Frequent at low and middle altitudes, especially on the west slope, in thin woods or on open rocky hillsides; abundant about Sun Camp; rare in the Many Glacier region. B. C. to Calif. and Mont.—Slender shrub, 1 to 2 meters high; leaves ovate or oval, toothed, 4 to 10 cm. long, hairy; flowers creamy white, in dense pointed panicles 10 to 20 cm. long; petals 1.5 to 2 mm. long; fruit of small hairy achenes inclosed in the calyx.

A handsome shrub, which remains in flower nearly all summer. The flowers are slightly fragrant.

4. **POTENTILLA** L. CINQUEFOIL.

Herbs or shrubs; leaves compound, with 3 or more digitate or pinnate leaflets; flowers in cymes or rarely solitary; petals yellow or sometimes purple; stamens usually 20; fruit of small achenes.

Plants shrubby . . . . . **1. P. fruticosa.**
Plants herbaceous.
  Leaflets 3.
    Cymes very leafy; leaflets green on both sides; plants not tufted. **2. P. monspeliensis.**
    Cymes not leafy; leaflets white-woolly beneath; plants in dense tufts or mats. **9. P. nivea.**
  Leaflets 5 or more.
    Leaves pinnate, some of the leaflets attached along the sides of the petiole.
      Plants with long runners; flowers solitary in the axils of small leaves on the runners . . . . . **16. P. anserina.**

Plants without runners; flowers in cymes.
Petals purple . . . . . **17. P. palustris.**
Petals yellow.
Leaflets almost equally white-hairy on both surfaces . . . . **3. P. hippiana.**
Leaflets green on the upper surface.
Leaflets toothed; style longer than the mature achene, slender. **4. P. pulcherrima.**
Leaflets deeply lobed; style not longer than the achene, thickened at the base.
Leaflets 7 to 15, grayish beneath . . . . . **5. P. pennsylvanica.**
Leaflets usually 5, white beneath . . . . . **6. P. platyloba.**
Leaves digitate, the leaflets all attached at the end of the petiole.
Leaflets not at all woolly beneath, the pubescence of straight hairs.
Leaflets nearly glabrous . . . . . **7. P. glaucophylla.**
Leaflets densely hairy on one or both surfaces . . . . . **8. P. nuttallii.**
Leaflets with woolly matted hairs on the lower surface.
Leaflets 5, 1 to 2 cm. long; plants 10 to 15 cm. high. **10. P. quinquefolia.**
Leaflets more than 5 in most of the leaves, usually more than 3 cm. long; plants commonly 20 to 60 cm. high.
Leaflets divided more than halfway to the margin into narrow lobes. **11. P. blaschkeana.**
Leaflets toothed or lobed less than halfway to the margin.
Leaflets shallowly toothed, with rounded or obtuse teeth. **12. P. filipes.**
Leaflets deeply toothed, with lanceolate or oblong, often acutish teeth.
Petioles with loosely spreading hairs . . . . . **13. P. gracilis.**
Petioles with appressed or ascending hairs.
Inflorescence dense, leafy; leaflets white beneath . **14. P. dichroa.**
Inflorescence loose and open, not leafy; leaflets grayish green beneath . . . . . **15. P. viridescens.**

1. Potentilla fruticosa L. BUSH CINQUEFOIL. Common at nearly all altitudes, chiefly on open slopes or in meadows; abundant in low places on prairie. Alaska to Calif., N. Mex., N. J., and Lab.; also in Eur. and Asia. (*Dasiphora fruticosa* Rydb.)—Densely branched shrub, 0.3 to 1 meter high, with shredded bark; leaves pinnate, the leaflets 3 to 7, silky-hairy, 1 to 2 cm. long, entire; flowers solitary or in small clusters, 1.5 to 3 cm. broad.

A conspicuous shrub when covered with the bright yellow flowers. Above timber line the plants are sometimes prostrate. One plant was noticed which had creamy white flowers.

2. Potentilla monspeliensis L. Frequent at low and middle altitudes, in meadows, woods, or thickets, or on slopes, sometimes in sphagnum bogs. Widely distributed in N. Amer., Eur., and Asia.—Plants biennial, stout, 20 to 50 cm. high, very leafy, loosely hairy; leaflets 3 to 7 cm. long, toothed; petals slightly shorter than the sepals.

3. Potentilla hippiana Lehm. Frequent on the east slope at low altitudes, on prairie or open hillsides. Alta. and Sask. to N. Mex. and Ariz.—Stems stout, 20 to 50 cm. high; leaflets 7 to 11, 2 to 5 cm. long, coarsely toothed; petals 6 to 8 mm. long.

4. Potentilla pulcherrima Lehm. Occasional on the east slope at middle altitudes or above timber line, on open hillsides. Alta. and Sask. to N. Mex. and Utah.—Stems 25 to 50 cm. high, hairy; leaflets 5 or 7, 1.5 to 6 cm. long, white-woolly beneath, the lower leaflets smaller than the others; petals 5 to 7 mm. long.

5. Potentilla pennsylvanica L. Frequent at low altitudes, on prairie or open slopes. Yukon to B. C., N. Mex., and Kans.—Stems stout, 30 to 60 cm. high; leaflets 1 to 7 cm. long, with linear or oblong lobes; petals about as long as the sepals.

6. Potentilla platyloba Rydb. St. Mary, on rocky flats. Alta. to Colo.—Stems stout, 30 to 50 cm. high; leaflets 2 to 6 cm. long, green above, white beneath; petals about as long as the sepals.

7. Potentilla glaucophylla Lehm. Common above timber line, in meadows or on rocky slopes or rock slides; sometimes at middle a itudes, on moist open slopes. B. C. to Sask., N. Mex., and Utah.—Stems slender, 10 to 50 cm. high, nearly glabrous; leaflets 1 to 5 cm. long, coarsely toothed, green; petals 6 to 10 mm. long.

8. Potentilla nuttallii Lehm. Common on the east slope at low and middle altitudes, in woods or thickets or on open hillsides. B. C. to Oreg., Colo., and Sask.—Stems 30 to 60 cm. high, hairy; leaflets 3 to 10 cm. long, coarsely toothed; petals 6 to 8 mm. long.

9. Potentilla nivea L. Occasional above timber line, on rocky slopes; sometimes about snow banks at middle altitudes. Alaska to Colo., Que., and Greenl.; also in Eur. and Asia.—Plants densely tufted, 10 to 20 cm. high; leaves mostly basal, the leaflets 1 to 2 cm. long, obovate, green above, white beneath, deeply toothed; flowers 1 to 6, 12 to 15 mm. broad.

10. Potentilla quinquefolia Rydb. Exposed summits, Mt. Henry and Sexton Glacier. B. C. to Colo. and Sask.—Plants densely matted; leaflets deeply toothed, green above, white beneath; petals slightly longer than the sepals.

11. Potentilla blaschkeana Turcz. Frequent at low altitudes, in thickets or on prairie or open slopes. B. C. and Alta. to Wyo. and Calif.—Stems 40 to 60 cm. high, silky-hairy; leaflets 4 to 9 cm. long, green above, white beneath; petals 7 to 10 mm. long.

12. Potentilla filipes Rydb. Frequent on the east slope at low altitudes, in thickets or on prairie or open hillsides. Alta. to N. Mex. and Man.—Stems stout, 20 to 50 cm. high, silky-hairy; leaflets 2 to 6 cm. long, green above, white beneath; petals 6 to 8 mm. long.

13. Potentilla gracilis Dougl. Occasional at low or middle altitudes, in woods or on open slopes. B. C. to Oreg. and Mont.—Stems 30 to 70 cm. high, hairy; leaflets 3 to 6 cm. long, green above, whitish beneath; petals nearly 1 cm. long.

14. Potentilla dichroa Rydb. Dry rocky hilltop near foot of Lake McDermott. Oreg. to Utah and Mont.—Stems stout, 20 to 50 cm. high, densely white-hairy; leaflets 2 to 6 cm. long, green above, white beneath; petals 6 to 8 mm. long.

15. Potentilla viridescens Rydb. Frequent on the east slope at low altitudes, in thickets or on prairie. Alta. to Wyo. and Man.—Stems stout, 30 to 60 cm. high, silky-hairy; leaflets 3 to 5 cm. long, coarsely toothed; petals about as long as the sepals.

16. Potentilla anserina L. SILVERWEED. In thickets and about low places on prairie at east entrance. Widely distributed in N. Amer., Eur., and Asia. (*Argentina anserina* Rydb.)—Leaflets 9 to 31, obovate or oval, 1 to 4 cm. long, green on the upper surface, white-silky beneath; petals rounded, 7 to 10 mm. long, yellow.

The Blackfoot Indians employed the root as a remedy for diarrhea. *Potentilla anserina concolor* Seringe (*Argentina argentea* Rydb.) is a form with leaflets densely silvery-silky on both surfaces. It grows with the typical form, and is found about the east entrance.

17. Potentilla palustris (L.) Scop. MARSHLOCKS. Sphagnum bogs on the west slope. Alaska to Calif., Wyo., N. H., and Greenl. (*Comarum palustre* L.)—Perennial,

20 to 40 cm. high, slightly hairy, with long rootstocks; leaflets 5 or 7, oval or elliptic, 5 to 8 cm. long, pale beneath; calyx enlarging in fruit and becoming purplish; petals about half as long as the sepals; fruit of achenes on a receptacle, this becoming large and spongy.

5. DRYMOCALLIS Fourr.

Perennial herbs with viscid pubescence; leaves pinnate, the leaflets broad, deeply toothed; flowers in cymes; petals cream-colored or pale yellow; fruit of numerous small achenes.

Petals about as long as the sepals; plants usually 30 to 60 cm. high . **1. D. glandulosa.**
Petals much longer than the sepals; plants usually 15 to 20 cm. high.
2. D. pseudorupestris.

1. Drymocallis glandulosa (Lindl.) Rydb. Common on the east slope at low and middle altitudes, in woods or thickets or on open hillsides. B. C. to Calif., N. Mex., and S. Dak.—Plants very hairy and viscid; leaflets 7 or 9, green, 1.5 to 4 cm. long, coarsely toothed and often lobed.

2. Drymocallis pseudorupestris Rydb. Frequent at middle and high altitudes, on open rocky slopes or rock slides, sometimes in woods. Alta. to Idaho and Wyo.—Plants hairy and viscid, usually tufted; leaflets 7 or 9, 1 to 3 cm. long; flowers 1.5 to 2 cm. broad.

6. FRAGARIA L. Strawberry.

Perennial, with long runners; leaves basal, the 3 leaflets broad, toothed; petals white, obtuse; fruit of numerous seedlike achenes on a fleshy red receptacle.

Plants green, not glaucous; teeth of the leaflets usually acute . . . . **1. F. bracteata.**
Plants pale and somewhat glaucous; teeth of the leaflets rounded or obtuse.
Hairs of the petioles appressed . . . . . **2. F. glauca.**
Hairs of the petioles spreading . . . . . **3. F. platypetala.**

1. Fragaria bracteata Heller. Frequent, especially on the west slope, at low and middle altitudes, in woods or thickets. B. C. to Calif., N. Mex., and Mont.—Pubescence mostly of spreading hairs; leaflets thin, 2 to 6 cm. long, pale beneath; petals about twice as long as the sepals.

2. Fragaria glauca (S. Wats.) Rydb. Frequent at low and middle altitudes, sometimes near timber line, in woods or thickets or on open slopes. B. C. to N. Mex. and S. Dak.—Leaflets rather thick, 3 to 5 cm. long, coarsely toothed, silky-hairy beneath or nearly glabrous; flowers 1.5 to 2 cm. broad.

3. Fragaria platypetala Rydb. Occasional in woods or thickets at middle altitudes, and sometimes above timber line. Alaska to Calif., Wyo., and Mont.—Leaflets rather thick, 2 to 6 cm. long, silky-hairy beneath; flowers 1.5 to 2 cm. broad.

7. SIBBALDIA L.

1. Sibbaldia procumbens L. Common above timber line, in meadows and on rock slides; occasionally found at lower altitudes, a few plants even at the east entrance. Alaska to Calif., N. Mex., N. H., and Greenl.; also in Eur. and Asia.—Perennial with short rootstocks, 10 cm. high or less, somewhat hairy; leaves slender-stalked, the 3 narrow leaflets 1 to 3 cm. long, 3 to 5-toothed near the end; flowers few, in dense cymes; petals yellow, shorter than the sepals; fruit of small achenes.

The plant often forms dense carpets in alpine meadows.

8. DRYAS L. Dryad.

Low prostrate shrubs, forming dense mats; leaves petioled, with low rounded teeth, thick and leathery, white-woolly beneath; flowers solitary on naked stems; sepals and petals each 8 or 10; fruit of numerous achenes, each with a long hairy tail.

Petals white, spreading; leaves broadly rounded or notched at the base.
1. D. octopetala.
Petals yellow, erect or ascending; leaves narrowed at the base . . **2. D. drummondii.**

1. **Dryas octopetala** L. WHITE DRYAD. PLATE 48, B. Common above timber line, on rocky slopes and rock slides. Alaska to Wash., Colo., and Greenl.; also in Eur. and Asia.—Leaves oval or oblong, 6 to 20 mm. long, green and nearly glabrous on the upper surface; stems 5 to 15 cm. long; calyx black-hairy; petals 1 to 1.5 cm. long.

A handsome plant, whose flowers soon fade. It appears to be more abundant at Piegan Pass than elsewhere, and in some alpine localities it is rare or absent.

2. **Dryas drummondii** Richards. YELLOW DRYAD. Occasional above timber line, on rock slides or rocky slopes. B. C. to Oreg., Mont., and Que.—Leaves 1 to 3 cm. long, green on the upper surface; stems 5 to 15 cm. high; calyx black-hairy; petals about 1 cm. long.

This plant, strangely enough, is abundant on rocky flats along the creek at St. Mary, and grows more luxuriantly there than at high altitudes. Evidently the seeds have been carried down by water.

9. GEUM L. AVENS.

Perennial hairy herbs with rootstocks; leaves pinnate, the terminal leaflet much larger than the others; flowers in cymes; fruit of numerous achenes, each with a hooked beak.—The achenes adhere readily to clothing by means of their beaks.

Sepals ascending, deep red; petals pinkish or pale yellow . . . . . **1. G. rivale.**
Sepals reflexed, green; petals bright yellow.
Lower part of the style glandular; petals narrowed at the base.
2. G. macrophyllum.
Lower joint of the style hairy but not glandular; petals rounded at the base.
3. G. strictum.

1. **Geum rivale** L. PURPLE AVENS. Swampy woods below Lake McDermott. B. C. to N. Mex., N. J., and Lab.; also in Eur. and Asia.—Stems 30 to 80 cm. high, hairy; terminal leaflet 4 to 10 cm. long, often broader than long, lobed and toothed; petals clawed, 7 to 10 mm. long.

2. **Geum macrophyllum** Willd. YELLOW AVENS. Common at low and middle altitudes, in moist woods or thickets, in bogs, or on brushy slopes. Alaska to Calif., Mont., N. H., and Newf.; also in Asia.—Plants 30 to 80 cm. high, very hairy; leaflets 5 to 15, the terminal one 5 to 10 cm. wide, lobed and toothed; petals 4 to 6 mm. long.

3. **Geum strictum** Soland. Occasional on the east slope at low altitudes, in meadows or swamps. B. C. to Mex., Pa., and Newf.—Stems 40 to 80 cm. high, hairy; leaflets 5 to 9 or more, toothed and often deeply lobed; stem leaves usually with 3 leaflets; petals 5 to 8 mm. long; fruit heads about 1.5 cm. thick.

10. SIEVERSIA Willd.

Perennial herbs with thick rootstocks; leaves mostly basal, pinnate, the leaflets deeply lobed; flowers solitary or in cymes; fruit of numerous achenes, these sometimes with hairy tails.

Leaflets nearly glabrous; petals yellow; tails of the achenes glabrous.
1. S. turbinata.
Leaflets densely hairy; petals pinkish; tails of the achenes hairy . . . . **2. S. ciliata.**

1. **Sieversia turbinata** (Rydb.) Greene. Piegan Pass, on open rocky slopes. Mont. to Nev. and N. Mex. (*Acomastylis turbinata* Greene.)—Plants 5 to 20 cm. high, densely tufted; leaflets 11 to 31, deeply lobed, the lobes narrow; petals 6 to 8 mm. long.

2. Sieversia ciliata (Pursh) Don. Occasional on the east slope at low altitudes, on prairie or open hillsides. B. C. and Alta. to N. Mex.—Stems 20 to 40 cm. high, few-flowered; leaves 10 to 20 cm. long; leaflets 9 to 19; petals slightly longer than the sepals.

The Blackfoot Indians are said to have used a decoction of the plant as a remedy for sore eyes.

11. RUBUS L.

Shrubs or herbs, often prickly or bristly; leaves compound and pinnate or digitate, or sometimes simple; flowers in corymbs or racemes, rarely solitary; stamens numerous; petals white; fruit of few or many small fleshy drupes, these united or distinct.

Leaves simple, lobed; stems unarmed . . . . . **1. R. parviflorus.**
Leaves compound, with 3 or more leaflets; stems often prickly or bristly.
  Stems herbaceous, unarmed, creeping; leaflets 5, digitate . . . . . **2. R. pedatus.**
  Stems woody, armed with prickles or bristles; leaflets various.
    Stems prostrate, armed with recurved prickles; leaves digitate, and often again pinnate, the leaflets deeply lobed; fruit a blackberry . . . **3. R. laciniatus.**
    Stems erect or nearly so, with straight prickles or bristles; leaves mostly pinnate, the 3 leaflets toothed or shallowly lobed; fruit a raspberry.
      Fruit red; stems bristly and with gland-tipped hairs . . . . . **4. R. strigosus.**
      Fruit purplish black; stems prickly, glabrous . . . . . **5. R. leucodermis.**

1. Rubus parviflorus Nutt. THIMBLEBERRY. Common at low and middle altitudes, usually in dense woods, sometimes extending to timber line. Alaska to Calif., N. Mex., and Ont. (*Rubacer parviflorum* Rydb.)—Shrub, 0.5 to 1 meter high, finely hairy; leaves maple-like, 5 to 30 cm. wide, 3 or 5-lobed; flowers panicled; petals rounded or oval, 1.5 to 3 cm. long; fruit like a raspberry, pale red, 1.5 to 2 cm. broad.

This is one of the most abundant plants of deep moist woods, often covering almost solidly many acres of ground. The large flowers are conspicuous. The fruit is soft and collapses when picked; it is rather dry and of poor flavor. It hangs on the bushes a long time and often sours.

2. Rubus pedatus Smith. Seen by the writer only on the Avalanche Lake trail, on mossy banks in deep woods. Alaska to Calif., Mont., and Alta.—Stems very slender, creeping; the flowering branches short; leaflets thin, 1 to 5 cm. long, irregularly toothed; flowers solitary; fruit of 1 to 5 loose red drupelets.

In general appearance the plant bears little resemblance to a raspberry or blackberry. The fruit is of good flavor, but it is too small to be edible.

3. Rubus laciniatus Willd. CUTLEAF BLACKBERRY. A few plants in thin woods at Lewis's.—Stems long and slender, very prickly; leaflets 5, each one deeply lobed or more often pinnate, with 3 or 5 leaflets, green, nearly glabrous; petals about 1 cm. long; fruit black, globose, 12 to 15 mm. in diameter.

Doubtless escaped from cultivation here. The native region of this species is not definitely known; it is often cultivated and has become naturalized on the Pacific coast.

4. Rubus strigosus Michx. RED RASPBERRY. PLATE 50, A. Common at middle altitudes, and sometimes at low altitudes or above timber line. B. C. to Oreg., N. Mex., N. C., and Lab. (*R. melanolasius* Focke.)—Shrub, usually 0.5 to 1 meter high, the stems brown or yellowish, often glaucous, very bristly; leaflets ovate or lanceolate, acute, green above, closely white-woolly beneath; petals 5 to 6 mm. long.

The fruit is of good flavor, but the seeds are very large. On rock slides the plants (as shown in the plate) are often only 10 to 15 cm. high, but such small plants often fruit abundantly.

5. Rubus leucodermis Dougl. BLACK RASPBERRY. Frequent about Lake McDonald, usually in rather thin woods. B. C. to Calif., Utah, and Mont.—Stems about a meter high, glaucous, prickly; leaflets broadly ovate, 4 to 10 cm. long, white beneath; petals shorter than the sepals.

The fruit is of good flavor.

12. ROSA L. ROSE.

Shrubs, usually armed with prickles; leaves pinnate, the leaflets toothed; flowers large, solitary or clustered, the petals pink; stamens numerous; fruit red or orange, consisting of a thickened fleshy wall (hypanthium), with numerous seedlike achenes on the inside.—The Blackfoot Indians used a drink made from the roots as a remedy for diarrhea. Doubtless they, like other American Indians, ate the fruits, at least in times of famine.

Sepals early falling from the fruit . . . . . **1. R. gymnocarpa.**
Sepals remaining upon the top of the fruit.
  Stems without a pair of prickles just below the base of the petiole.
    Fruit pear-shaped, with a distinct neck . . . . . **2. R. acicularis.**
    Fruit globose, almost without a neck . . . . . **3. R. bourgeauiana.**
  Stems usually with a pair of prickles just below the base of each petiole.
    Flowers mostly solitary; fruit usually about 1.5 cm. thick . . . . **4. R. nutkana.**
    Flowers mostly clustered; fruit usually 1 cm. thick or less.
      Fruit pear-shaped, with a distinct neck . . . . . **5. R. pyrifera.**
      Fruit globose, the neck usually none.
        Petioles with fine glands and glandular hairs . . . . . **6. R. fendleri.**
        Petioles without glands.
          Leaflets glabrous beneath or nearly so . . . . . **7. R. woodsii.**
          Leaflets finely pubescent beneath . . . . . **8. R. ultramontana.**

1. Rosa gymnocarpa Nutt. Frequent on the west slope at low and middle altitudes, in thin or deep woods. B. C. to Calif. and Mont.—Slender shrub, usually about 60 cm. high, armed with slender straight prickles; leaflets 5 or 7, 1 to 3 cm. long, thin, glabrous; flowers solitary; petals 1 to 2 cm. long; fruit 8 to 10 mm. long.

A rather handsome shrub when in fruit. The berry-like fruit is different in appearance from that of our other roses.

2. Rosa acicularis Lindl. Occasional on the west slope at low altitudes, on lake shores and brushy hillsides. Alaska to Wyo., Mich., and N. Y.—About 1 meter high; leaflets 3 to 9, 1.5 to 4 cm. long, pale beneath and finely hairy; petals 2 to 2.5 cm. long; fruit 1.5 to 2 cm. long.

3. Rosa bourgeauiana Crép. Common at low and middle altitudes, in woods or thickets or on open slopes. Mont. to Colo. and Ont.—Usually 0.5 to 1 meter high, with very numerous straight prickles; leaflets mostly 5 or 7, 1 to 4 cm. long, pale beneath and finely pubescent; petals 2 to 2.5 cm. long; fruit 1 to 1.5 cm. thick.

The most common rose of the park.

4. Rosa nutkana Presl. Occasional at low altitudes, in wet thickets or along moist cliffs. Alaska to Calif. and Wyo.—Usually 0.5 to 1 meter high, armed with straight prickles; leaflets 5 to 9, 1.5 to 5 cm. long, nearly glabrous; petals 2 to 3 cm. long.

5. Rosa pyrifera Rydb. Low thickets about Lake McDonald. Wash. to Calif., Wyo., and Mont.—Plants 0.5 to 1 meter high, armed with a few straight prickles; leaflets 5 or 7, 2 to 4 cm. long, pale beneath and finely hairy; petals about 2 cm. long; fruit 1.5 to 2 cm. long.

About Belton there is a curious form of this species with wholly unarmed stems.

6. Rosa fendleri Crép. Belton, in thin woods. Mont. to Ariz., N. Mex., and S. Dak.—About a meter high, armed with slender straight prickles; leaflets 5 or 7, 1 to 3 cm. long, glandular beneath; petals about 1.5 cm. long.

7. Rosa woodsii Lindl. East entrance, on shale slopes. B. C. to Colo. and N. Dak.—Slender shrub, about 60 cm. high, armed with slender straight prickles; leaflets 5 or 7, 1 to 2 cm. long; fruit 8 to 10 mm. thick.

8. Rosa ultramontana (S. Wats.) Heller. Frequent on the east slope at low altitudes, in woods or thickets. Oreg. to Calif. and Mont.—Slender shrub, about 60 cm. high, armed with slender straight prickles; leaflets 5 or 7, 1.5 to 4 cm. long; petals about 1.5 cm. long; fruit 8 to 10 mm. thick.

43. MALACEAE. Apple Family.

Shrubs or trees; leaves alternate, with stipules, toothed, lobed, or pinnate; petals 5, white; stamens numerous; fruit fleshy, somewhat resembling a small apple.—The cultivated apples, pears, and quinces belong to this family.

Leaves pinnate, with numerous leaflets . . . . . **1. SORBUS.**
Leaves merely toothed or shallowly lobed.
  Branches armed with stout spines; leaves usually somewhat lobed; flowers in corymbs . . . . . **2. CRATAEGUS.**
  Branches unarmed; leaves toothed but not at all lobed; flowers in racemes. **3. AMELANCHIER.**

1. SORBUS L. Mountain-ash.

Unarmed shrubs; leaflets toothed; flowers in dense cymes; fruit very sour.
Leaflets very acute, toothed to near the base; fruit red; calyx not glaucous. **1. S. sambucifolia.**
Leaflets mostly rounded or very obtuse at the apex, usually entire near the base; fruit purplish; calyx somewhat glaucous . . . . . **2. S. sitchensis.**

1. Sorbus sambucifolia (Cham. & Schlecht.) Roem. Frequent at low and sometimes at middle altitudes, in woods or on open slopes. Alaska to Oreg., Ariz., and Alta.; also in Siberia. (*S. scopulina* Greene.)—Shrub, 1 to 2 meters high, sometimes forming dense clumps; leaflets 11 to 13, elliptic-oblong, 3 to 6 cm. long, glabrous or nearly so; fruit orange or scarlet, 6 to 8 mm. in diameter.

2. Sorbus sitchensis Roem. Common, usually near and sometimes above timber line, in woods or on open slopes. Alaska to Oreg. and Mont.; also in Japan. (*S. occidentalis* Greene.)—Shrub, 1 to 2.5 meters high, with few or no branches; leaflets usually 9 or 11, oval-oblong, 3 to 5 cm. long, paler beneath, glabrous or nearly so; petals about 5 mm. long; fruit turning orange and finally purple, about 8 mm. long.

The shrub is conspicuous when covered with the large clusters of handsome fruit. The flowers are sweet-scented. The leaves turn yellow in autumn, and even in midsummer they are often discolored with yellow spots, due to the presence of a rust.

2. CRATAEGUS L.

1. Crataegus douglasii Lindl. Black hawthorn. Common on the west slope at low and middle altitudes, on lake shores and along streams; occasional on the east slope at low altitudes, sometimes on open slopes. B. C. to Calif., N. Mex., and Mich.—Shrub or tree, 1 to 5 meters high, armed with short stout spines; leaves stalked, ovate or oval, 2 to 7 cm. long, toothed and lobed, glabrous or nearly so; flowers white, in small clusters; fruit purplish black, juicy.

The plants on the east slope are mostly low and stunted; they are rather abundant along the shore at the foot of St. Mary Lake. The leaves often turn red in late summer. The fruit is edible, but of rather poor quality; it is much more juicy than in the common eastern species.

3. AMELANCHIER Medic.

1. Amelanchier alnifolia Nutt. Serviceberry. Common at low and middle altitudes, in woods or thickets or on open slopes. Yukon to Colo., Nebr., and Mich.—Slender shrub, 0.5 to 2 meters high, nearly glabrous; leaves oval or rounded, 2 to 6

cm. long, toothed; petals about 1 cm. long; fruit 6 to 10 mm. long, purple or nearly black, with a pale bloom.

Known also as juneberry and shadbush. The flowers appear early in the season. The fruit is edible but of rather insipid flavor; in dry places it is small and almost mealy, but in damp situations it is large and very juicy. It was much used by the Indians of the West, who often dried the fruit for use in winter. Among the Blackfoot Indians serviceberries were the most important vegetable food. They were employed, either fresh or dried, in soups or stews. In exposed places the shrubs are sometimes dwarfed and prostrate.

44. AMYGDALACEAE. Almond Family.

1. PRUNUS L.

Shrubs or trees; leaves alternate, petioled, finely toothed; flowers white, in racemes or corymbs; sepals and petals each 5; stamens 15 to 30; fruit juicy, containing a single seedlike stone.—The cultivated plums, prunes, and cherries belong to this genus, and almonds, apricots, and peaches are closely related.

Flowers few, in corymbs; petals about 7 mm. long; leaves with rounded teeth. **1. P. corymbulosa.**

Flowers numerous, in racemes, these leafy at the base; petals about 5 mm. long; leaves with acute teeth . . . . . **2. P. melanocarpa.**

1. Prunus corymbulosa Rydb. PIN CHERRY. Common on the west slope at low or middle altitudes, on open rocky slopes. Mont. and Wyo.—Shrub, 0.5 to 1.5 meters high; leaves ovate or lanceolate, 3 to 8 cm. long, acute, glabrous; flowers 3 to 6 in each cluster; fruit oval, red or red and yellow, nearly 1 cm. long.

In 1919, probably because of the dry season, few bushes bore any fruit. The fruit is extremely bitter.

2. Prunus melanocarpa (A. Nels.) Rydb. CHOKECHERRY. Common at low altitudes and occasional at middle elevations, usually on open slopes but sometimes in woods or along lakes and streams. B. C. to Calif., N. Mex., and N. Dak.—Shrub, 0.5 to 2 meters high or (on the west slope) sometimes a small tree; leaves oval or obovate, 4 to 8 cm. long, obtuse or acute, pale beneath, glabrous or nearly so; fruit 6 to 8 mm. long, red to nearly black.

The fruit is edible, but the flesh is scant and the flavor is somewhat bitter. Among the Blackfoot Indians chokecherries were eaten raw, and they were added to soups, or, pounded up, seeds and all, they were mixed with dried meat (pemmican). The bark was used medicinally.

45. FABACEAE. Bean Family.

Annual or perennial herbs; leaves alternate, compound, with 3 or more leaflets; stipules present; calyx of 5 or 4 more or less united sepals, often 2-lipped; corolla shaped like that of a bean or pea; petals 5, the upper one (standard) broader than the others, the 2 lateral ones (wings) curved upward, the 2 lowest ones (keel) more or less united; stamens usually 10, sometimes 9; fruit a legume (more or less like that of a bean or pea), 1 or 2-celled, usually opening along both edges.—The name Leguminosae is often used for the family.

Leaves with 3 or more leaflets all attached at the end of the leaf stalk.
- Leaflets 5 or more . . . . . **1. LUPINUS.**
- Leaflets 3.
  - Leaflets not toothed; flowers yellow; pod long and narrow. **2. THERMOPSIS.**
  - Leaflets finely toothed; flowers yellow, white, pink, or red-purple; pod very short and small.
    - Flowers in heads . . . . . **3. TRIFOLIUM.**
    - Flowers (yellow) in slender racemes . . . . . **4. MELILOTUS.**

Leaves with 5 or more leaflets, some of them attached along the sides of the leaf stalk
Leaves with a tendril at the end.
Flowers purple; leaflets green . . . . . **9. VICIA.**
Flowers yellowish white; leaflets pale on the under side . . . **10. LATHYRUS.**
Leaves without tendrils.
Leaflets dotted with glands; fruit covered with hooked prickles.
5. GLYCYRRHIZA
Leaflets not gland-dotted; fruit not prickly.
Pods very flat, scalloped along the edges. Flowers pale yellow or purple.
6. HEDYSARUM.
Pods not scalloped along the edges.
Keel of the corolla blunt; flower stems usually leafy . . **7. ASTRAGALUS.**
Keel of the corolla sharp-pointed; flower stems not leafy. **8. OXYTROPIS.**

1. LUPINUS L. LUPINE.

Perennials, usually with silky pubescence; leaves with 5 to 15 narrow entire leaflets attached at the end of the leaf stalk; flowers in racemes, usually blue or purple; pods flattened, hairy.

Plants low, 15 cm. high or less; leaves all basal . . . . . **1. L. minimus.**
Plants taller, usually 30 to 60 cm. high, with leafy stems.
Leaflets glabrous on the upper surface.
Leaflets flat; keel of the corolla hairy along the edges . . . . . **2. L. scheuberae.**
Leaflets usually folded; keel glabrous . . . . . **3. L. tenellus.**
Leaflets hairy on both surfaces.
Hairs of the stem spreading.
Hairs of the stem equal in length, all short . . . . . **4. L. sericeus.**
Hairs of the stem of 2 kinds, part of them long and part short.
5. L. leucophyllus.
Hairs of the stem all appressed.
Plants green, thinly silky . . . . . **6. L. argenteus.**
Plants gray or whitish, densely silky.
Bracts of the spikes awl-shaped, longer than the flower buds.
7. L. flexuosus.
Bracts lanceolate, not longer than the buds . . . . . **8. L. leucopsis.**

1. Lupinus minimus Dougl. DWARF LUPINE. Open rocky slopes at Piegan Pass; also on exposed rocky hilltop at east entrance. Wash. and Oreg. to Mont. and Alta.—Stems 10 to 15 cm. high, densely tufted; leaflets 5 to 9, oblanceolate, 5 to 15 mm. long, densely silky; racemes short and dense; corolla 1 cm. long.

2. Lupinus scheuberae Rydb. Frequent about east entrance, on open slopes or in aspen thickets. Mont., Wyo., and Utah.—Stems 30 to 70 cm. high; leaflets about 7, oblanceolate, 3 to 7 cm. long, acute or obtuse; corolla about 12 mm. long; pods about 2 cm. long.

3. Lupinus tenellus Dougl. Common on the east slope at low or even middle altitudes, on open rocky hillsides or along streams. Wash. to Calif., Colo., and Mont.—Plants 30 to 60 cm. high, much branched from the base and forming large bushy clumps; leaflets linear or linear-oblanceolate, 1 to 4 cm. long, acute or obtuse; corolla 10 to 12 mm. long, blue or purple; pod 3 to 5-seeded.

One plant found along Appekunny Creek had pinkish white flowers.

4. Lupinus sericeus Pursh. Rocky slopes of Altyn Peak. Oreg. to Wyo. and S. Dak.—Plants 30 to 60 cm. high, much branched, whitish-hairy; leaflets 5 to 10, oblanceolate, 3 to 6 cm. long, acute or obtuse; corolla blue-purple, about 12 mm. long; pods 4 to 6-seeded.

5. Lupinus leucophyllus Dougl. Occasional on the east slope at low or middle altitudes, on open hillsides or in aspen thickets. Wash. to Calif., Utah, and Mont.—

Plants 30 to 60 cm. high, gray-hairy; leaflets 7 to 10, oblanceolate, 3 to 6 cm. long; corolla 10 to 12 mm. long; pod 5 or 6-seeded.

6. Lupinus argenteus Pursh. Frequent about east entrance and Belton, in woods or thickets. Oreg. and Calif. to Colo. and N. Dak.—Plants 40 to 80 cm. high, branched; leaflets 7 or 8, narrowly oblanceolate, flat or folded, 2 to 6 cm. long; corolla violet, 1 cm. long; pods 5 or 6-seeded.

7. Lupinus flexuosus Lindl. Common on the east slope at low and middle altitudes, usually on open hillsides. Wash. to Mont.—Plants 30 to 50 cm. high, forming dense bushy clumps; leaflets 7 to 10, oblanceolate, 2 to 4 cm. long; corolla about 1 cm. long, violet.

Our most common and showy species.

8. Lupinus leucopsis Agardh. Occasional at low altitudes, in thickets or on open slopes. Wash. to Nev., Wyo., and Sask.—Plants 30 to 60 cm. high; leaflets 6 to 12, oblanceolate, 2 to 5 cm. long; corolla blue, about 1 cm. long; pods 2 to 3 cm. long.

2. THERMOPSIS R. Br.

1. Thermopsis rhombifolia (Nutt.) Richards. YELLOW PEA. Open hillsides and prairie about the east entrance. Sask. to Nebr. and Colo.—Perennial, with rootstocks, nearly glabrous, 10 to 30 cm. high; leaves with large stipules, the 3 leaflets obovate, 2 to 3 cm. long, entire; flowers in racemes, yellow, 1.5 to 2 cm. long; pods lender, spreading, 5 to 6 cm. long, with appressed hairs.

3. TRIFOLIUM L. CLOVER.

Annuals or perennials; leaves with 3 leaflets, the leaflets finely toothed; flowers small, in heads; pod very small, inclosed by the withered corolla.

Flowers yellow; plants annual . . . . . **1. T. procumbens.**
Flowers white, pink, or red-purple; plants perennial.
  Heads not stalked; flowers sessile, red-purple . . . . . **2. T. pratense.**
  Heads slender-stalked; flowers short-stalked, white or pinkish.
    Plants with slender runners, these rooting at the joints; leaflets notched at the end . . . . . **3. T. repens.**
    Plants without runners; leaflets usually rounded at the end. **4. T. hybridum.**

1. Trifolium procumbens L. HOP CLOVER. A few plants along the railroad at Belton. Native of Eur.; naturalized in N. Amer.—Plants slender, with nearly prostrate stems; leaflets obovate, 1 to 1.5 cm. long.

2. Trifolium pratense L. RED CLOVER. Common on the west slope at low altitudes, and extending well up along the trails; scarce on the east slope, but occasionally found at low altitudes. Native of Eur.; cultivated and naturalized in N. Amer.—Plants 20 to 50 cm. high, somewhat hairy; leaflets oval or ovate, 2 to 3 cm. long, often with a purplish spot in the middle; flowers about 1.5 cm. long.

Red clover is abundant in some places about Belton.

3. Trifolium repens L. WHITE CLOVER. Common on the west slope at low altitudes, and occasional on the east slope; often found high up along the trails. Native of Eur. and Asia; widely naturalized in N. Amer.—Stems slender, glabrous; leaflets obovate, 5 to 20 mm. long, glabrous; flowers 7 to 8 mm. long.

Very abundant in some places about Belton.

4. Trifolium hybridum L. ALSIKE CLOVER. Common at low altitudes, especially on the west slope, and extending well up along the trails. Native of Eur.; naturalized in N. Amer.—Plants 20 to 50 cm. high, glabrous; leaflets broadly obovate, 1 to 3 cm. long; flowers 7 to 9 mm. long, nearly always pink.

This is abundant in woods and along roads near Belton. On both slopes it is more common than white clover; the two usually grow together.

4. MELILOTUS Hill.

1. Melilotus officinalis (L.) Lam. YELLOW SWEETCLOVER. A few plants along the railroad at Belton. Native of Eur.; naturalized in N. Amer.—Perennial, 0.3 to 1 meter high, glabrous or nearly so, loosely branched, sweet-scented; leaflets 3, oblong or obovate, 2 to 4 cm. long, finely toothed; flowers yellow, 5 to 7 mm. long, in loose racemes; pod 2.5 to 3.5 mm. long, 1 or 2-seeded.

5. GLYCYRRHIZA L.

1. Glycyrrhiza lepidota Nutt. WILD LICORICE. Occasional about Belton and the east entrance, on dry banks or along streams. Wash. to Calif., Mex., N. Y., and Ont.—Perennial, 0.3 to 1 meter high, glabrous or nearly so, branched; leaflets 11 to 19, oblong, 2 to 3.5 cm. long, entire, gland-dotted; flowers 12 mm. long, yellowish or greenish white, in racemes; pod about 1.5 cm. long, covered with hooked prickles.

The licorice of commerce is obtained from a species of *Glycyrrhiza* which grows in the Mediterranean region.

6. HEDYSARUM L. HEDYSARUM.

Perennials with leafy stems; leaflets numerous, entire; flowers in long racemes; pods flat, scalloped along both edges, not opening.

Leaflets gray, densely silky-hairy; fruit with appressed hairs; teeth of the calyx longer than the tube . . . . . **1. H. cinerascens.**

Leaflets green, with few scattered appressed hairs; fruit glabrous; teeth of calyx shorter than the tube.

Flowers yellowish white . . . . . **2. H. sulphurescens.**

Flowers pink or purple . . . . . **3. H. americanum.**

1. Hedysarum cinerascens Rydb. GRAY HEDYSARUM. Hillsides at east entrance, *Umbach*. Alta. to Utah and N. Dak.—Plants 30 to 50 cm. high; leaflets 9 to 15, oval, 1 to 2 cm. long, obtuse; corolla purple, about 1.5 cm. long; pods 6 to 8 mm. long.

2. Hedysarum sulphurescens Rydb. YELLOW HEDYSARUM. Common at nearly all altitudes, especially on the east slope, mostly on open hillsides or rock slides or in meadows. B. C. and Alta. to Wyo.—Plants usually 30 to 50 cm. high, nearly glabrous; leaflets 11 to 15, oval or oblong, 1 to 3 cm. long; corolla about 1.5 cm. long; pods 8 to 20 mm. long, 2.5 to 4 mm. wide.

A rather handsome plant when in flower, resembling some species of *Astragalus*. Above timber line the plants are frequently only 10 cm. high.

3. Hedysarum americanum (Michx.) Britton. PURPLE HEDYSARUM. Apparently rare; shale slide at east entrance; sandbar along lowest Swiftcurrent Lake. Alaska to Wyo., Vt., and Lab.—Plants 20 to 50 cm. high, in clumps, nearly glabrous; leaflets 11 to 21, oval or oblong, 1 to 3 cm. long, obtuse; corolla 12 to 15 mm. long; pods with 3 to 5 joints.

7. ASTRAGALUS L. MILKVETCH.

Perennials; leaves odd-pinnate, the leaflets entire; flowers white, yellow, or purple, in spikes or racemes; pods very variable, flat or terete, thin or woody, sometimes inflated.

Pods covered with short black hairs.

Pods not flattened from the sides; leaflets usually notched at the apex.

1. A. alpinus.

Pods strongly flattened from the sides; leaflets not notched.

Corolla white or cream-colored; pods long-stalked in the calyx . . **2. A. macounii.**

Corolla purple; pods nearly sessile . . . . . **3. A. bourgovii.**

Pods glabrous or with white or gray hairs.

Leaflets glabrous on the upper surface; flowers white or pale yellow, sometimes tinged with purple.

Leaflets 1.5 to 4 mm. wide.
Pods flattened from the sides; leaflets obtuse . . . . . **4. A. tenellus.**
Pods not flattened; leaflets notched at the apex . . . . . **5. A. flexuosus.**
Leaflets 5 to 20 mm. wide.
Pods sessile in the calyx, thick and hard, not inflated; flowers nearly sessile.
6. A. carolinianus.
Pods stalked, thin, inflated; flowers slender-pediceled . . . **7. A. americanus.**
Leaflets finely or coarsely hairy on both surfaces, rarely glabrous on the upper surface, but the flowers then purple.
Pods glabrous or nearly so.
Leaflets with loose spreading hairs . . . . . **8. A. aboriginum.**
Leaflets with appressed silky hairs . . . . . **9. A. forwoodii.**
Pods densely hairy.
Leaves and stems with loose spreading hairs; flowers pale yellow.
10. A. drummondii.
Leaves and stems with fine appressed hairs; flowers purple or purplish.
Flowers 6 to 8 mm. long; pods about 8 mm. long . . . . **11. A. vexilliflexus.**
Flowers 15 to 20 mm. long; pods 10 to 25 mm. long.
Pod about 1 cm. long, not compressed; leaflets green, thinly silky.
12. A. goniatus.
Pod 1.5 to 2.5 cm. long, compressed; leaflets gray, densely silky.
13. A. missouriensis.

1. Astragalus alpinus L. Frequent above timber line, on open rocky slopes or rock slides; also along creek at east entrance. Alaska to N. Mex., Vt., and Lab.; also in Eur. and Asia. (*Tium alpinum* Rydb.)—Stems ascending or spreading, 10 to 25 cm. high, slender; leaflets 13 to 25, oval or rounded, 4 to 10 mm. long, with appressed hairs on one or both surfaces, usually shallowly notched; flowers purplish, 8 to 12 mm. long; calyx black-hairy; pod about 1 cm. long.

2. Astragalus macounii Rydb. Frequent at low and middle altitudes and sometimes above timber line, in moist woods or thickets, along streams, or on open slopes. B. C. and Alta. to Colo. (*Atelophragma macounii* Rydb.)—Stems slender, 30 to 60 cm. high, nearly glabrous; leaflets 9 to 17, oval or oblong, 1.5 to 3 cm. long, glabrous on the upper surface; calyx black-hairy; corolla about 8 mm. long; pods 1.5 to 2 cm. long.

Above timber line the plants are sometimes only 10 cm. high.

3. Astragalus bourgovii A. Gray. Common above and near timber line, in meadows and on rock slides; sometimes in woods or on open slopes at middle altitudes. B. C. and Mont. to S. Dak. (*Homalobus bourgovii* Rydb.)—Stems slender, 10 to 30 cm. long, erect or ascending, densely tufted; leaflets numerous, oblong, 4 to 10 mm. long, with sparse appressed hairs on both surfaces; flowers 8 to 10 mm. long, in a lax raceme, purple or violet; calyx black-hairy; pod 1 to 1.5 cm. long.

A graceful and handsome plant, often abundant in alpine meadows.

4. Astragalus tenellus Pursh. Occasional on the east slope at low altitudes, in creek beds or on open hillsides. Yukon to Utah and Nebr. (*Homalobus tenellus* Britton.)—Stems stout, erect, 20 to 40 cm. high, tufted; leaflets 13 to 21, linear or narrowly oblong, 8 to 12 mm. long, nearly glabrous; flowers about 1 cm. long, in short dense racemes; pods 8 to 12 mm. long, about 3 mm. wide, short-stalked.

5. Astragalus flexuosus Dougl. Hillsides at east entrance, *Umbach*. Alta to Utah, N. Mex., and Minn. (*Homalobus flexuosus* Rydb.)—Stems erect or ascending, 30 to 60 cm. long; leaflets 13 to 21, narrowly oblong, 5 to 15 mm. long, nearly glabrous; flowers about 1 cm. long, in long loose racemes; calyx white-hairy; pods 1.5 to 2 cm. long, 4 mm. thick, with appressed hairs.

6. Astragalus carolinianus L. Belton, in low woods and in thickets along river, B. C. to N. Mex., Fla., and Que. (*A. canadensis* L.)—Stems stout, 30 to 80 cm. high; leaflets 15 to 25, oval to oblong, 2 to 4 cm. long, nearly glabrous; flowers 1.5 cm. long, in dense racemes; pod 1 to 1.5 cm. long, terete or nearly so, thick, glabrous, long-beaked.

7. Astragalus americanus (Hook.) Jones. Frequent on the east slope at low altitudes, in thickets and along streams. Yukon to Wyo. and Que. (*Phaca americana* Rydb.)—Stems stout, erect, clustered, 30 to 80 cm. high; leaflets 7 to 17, oval or oblong, 2 to 4 cm. long, obtuse; flowers yellowish white, 12 mm. long, in dense racemes; pods glabrous, about 2 cm. long.

8. Astragalus aboriginum Richards. Trail to Iceberg Lake, on open bank. Yukon to Nev., Colo., and Sask. (*Atelophragma aboriginum* Rydb.)—Stems tufted, ascending, 20 to 30 cm. long, short-hairy; leaflets 9 to 15, narrowly oblong, 1 to 2 cm. long, acute or obtuse; flowers yellowish white, 1 cm. long, in loose racemes; pod 1.5 to 2 cm. long, slender-stalked, acute.

9. Astragalus forwoodii S. Wats. Occasional on the east slope at low altitudes, on open brushy hillsides. Mont., Wyo., and S. Dak. (*Atelophragma forwoodii* Rydb.)—Stems ascending, tufted, 10 to 30 cm. long; leaflets 9 to 17, oblong, 1 to 1.5 cm. long, acute or obtuse; flowers 7 to 8 mm. long, yellowish white, tipped with purple, in loose racemes; pod 1.5 to 2 cm. long, slender-stalked.

10. Astragalus drummondii Dougl. Occasional on the east slope at low altitudes, on open hillsides. Alta. to N. Mex. and Nebr. (*Tium drummondii* Rydb.)—Stems erect, 30 to 60 cm. high, stout, hairy; leaflets 25 to 31, oblong, obtuse, about 1 cm. long; flowers 1.5 to 2 cm. long, cream-colored; pods 2 to 2.5 cm. long, slender-stalked.

11. Astragalus vexilliflexus Sheld. Common on the east slope at low altitudes, on prairie or open hillsides, or in thickets. B. C. to Wyo. and Sask. (*Homalobus vexilliflexus* Sheld.)—Stems slender, ascending or prostrate, 10 to 30 cm. long, often forming dense mats; leaflets 7 to 11, oblong, 3 to 12 mm. long, densely covered, at least beneath, with appressed hairs; flowers purplish, 8 mm. long, in loose racemes; pod about 3 mm. wide, sessile.

12. Astragalus goniatus Nutt. Occasional on the east slope at low altitudes, on open or brushy hillsides. B. C. to N. Mex. and Sask.—Stems 10 to 20 cm. high, densely tufted, ascending; leaflets 15 to 21, oblong, obtuse, 5 to 12 mm. long; flowers 1.5 cm. long, purple, in dense headlike spikes; calyx usually with black hairs; pod about 1 cm. long, white-hairy.

13. Astragalus missouriensis Nutt. Belton, on dry gravel bank. Mont. to N. Mex. and Kans. (*Xylophacos missouriensis* Rydb.)—Stems 5 to 10 cm. long, densely clustered; leaflets 11 to 21, elliptic or obovate, 5 to 15 mm. long; flowers purple, in a short dense raceme; pod 7 to 8 mm. wide, long-beaked.

8. OXYTROPIS DC. Locoweed.

Perennials; leaves often all basal, with numerous leaflets; flowers usually in dense spikes, purple or yellowish white; pods mostly sessile, often partially 2-celled.—Some, at least, of the species of this genus are poisonous to stock, causing temporary paralysis or sometimes death.

Stems leafy; pods drooping . . . . . **1. O. deflexa.**
Stems naked; pods erect.
  Leaflets whorled . . . . . **2. O. splendens.**
  Leaflets opposite or alternate, not whorled.
    Flowers 1 to 4, on a stalk 4 cm. high or less . . . . . **3. O. parryi.**
    Flowers usually more than 4, often very numerous, on a stalk 5 to 30 cm. high.
      Leaflets and stems with numerous viscid glands; corolla purplish, at least when withered . . . . . **4. O. viscida.**

Leaflets and stems without glands; corolla yellowish white or yellow.
Stems usually 15 to 20 cm. high; calyx without black hairs . **5. O. gracilis.**
Stems usually less than 15 cm. high; calyx with black hairs.
Corolla about 1.5 cm. long; flowers few, yellowish white. **6. O. alpicola.**
Corolla about 2 cm. long; flowers numerous, yellow . . . . . **7. O. spicata.**

1. Oxytropis deflexa (Pall.) DC. Occasional at low altitudes, in woods or thickets. Alaska to N. Mex. and Idaho; also in Asia. (*Aragallus deflexus* Heller.)—Stems ascending, 10 to 40 cm. long, loosely hairy; leaflets 25 to 41, 5 to 15 mm. long, acute, loosely hairy; flowers dirty white, tipped with blue, 6 to 9 mm. long, in loose racemes; pod black-hairy.

2. Oxytropis splendens Dougl. Frequent on the east slope at low altitudes, on open hillsides or flats. Yukon to B. C., N. Mex., and Minn. (*Aragallus splendens* Greene; *A. richardsonii* Greene.)—Plants 10 to 30 cm. high, covered with long loose silky hairs; leaflets very numerous, 8 to 20 mm. long, acute or obtuse; flowers red-purple, 10 to 15 mm. long, in dense spikes; pods 1 to 1.5 cm. long, densely hairy.

3. Oxytropis parryi A. Gray. Above Sexton Glacier, on wind-swept rocky summit. Mont. to N. Mex. (*Aragallus parryi* Greene.)—Plants prostrate or nearly so, tufted; leaflets 11 to 19, 4 to 8 mm. long, silky-hairy; calyx black-hairy; corolla purple, 1.5 cm. long; pods 12 to 20 mm. long.

4. Oxytropis viscida Nutt. Frequent on the east slope at low altitudes, on dry open hillsides. Yukon to Nev. and Wyo. (*Aragallus viscidus* Greene; *A. viscidulus* Rydb.)—Plants 10 to 15 cm. high, forming dense clumps, very viscid and somewhat hairy; leaflets numerous, 5 to 12 mm. long, acute or obtuse; flowers in dense spikes; corolla 12 mm. long; pods 1 to 1.5 cm. long, black-hairy.

5. Oxytropis gracilis (A. Nels.) Jones. Common on the east slope at low altitudes, on prairie or open hillsides. Alta. to Idaho and S. Dak. (*Aragallus gracilis* A. Nels.)—Plants densely tufted, thinly silky-hairy; leaflets 21 to 31, 1 to 2 cm. long, acute; flowers in dense, often long spikes; corolla 1.5 cm. long, yellowish white; pods about 2 cm. long.

6. Oxytropis alpicola (Rydb.) Jones. Common above timber line in meadows or on rock slides. B. C., Alta., and Mont. (*Aragallus alpicola* Rydb.)—Plants often densely tufted; leaflets 9 to 17, 5 to 10 mm. long, obtuse or acute, with appressed silky hairs.

7. Oxytropis spicata (Hook.) Standl. East entrance, on hillsides, *Umbach*. Alta. to Wyo. and S. Dak. (*Aragallus spicatus* Rydb.)—Leaflets oval or oblong, 8 to 20 mm. long, usually obtuse, thinly silky; pods often black-hairy.

9. VICIA L.

1. Vicia americana Muhl. VETCH. Frequent at low altitudes, in woods or thickets. B. C. to Ariz., Va., and N. B.—Slender perennial, 0.3 to 1 meter high, nearly glabrous, climbing by tendrils at the ends of the leaves; leaflets 10 to 14, oval or oblong, 1.5 to 3 cm. long, entire; flowers purple, 1.5 to 2 cm. long, in racemes; pods flat, glabrous, 2 to 3 cm. long.

10. LATHYRUS L.

1. Lathyrus ochroleucus Hook. VETCHLING. Frequent at low altitudes, in moist woods or thickets. B. C. to Wyo., N. J., and Que.—Slender perennial, 0.3 to 1 meter high, glabrous, climbing by tendrils at the ends of the leaves; leaflets 4 or 6, oval, 2 to 5 cm. long, entire, pale beneath; flowers yellowish white, 1.5 cm. long, 5 to 10 in each raceme; pod flat, glabrous, 4 cm. long.

46. GERANIACEAE. Geranium Family.

1. GERANIUM L.

Herbs with opposite, deeply lobed leaves; petals 5; stamens 10; fruit of 5 long-beaked 1-seeded carpels, these separating at maturity, their beaks recoiling.—The cultivated geraniums do not belong to this genus but to a closely related one, *Pelargonium;* they are natives of southern Africa.

Petals about as long as the sepals, pink; plants annual or biennial . . **1. G. bicknellii.**
Petals much longer than the sepals, white or purple; plants perennial.
Petals white; plants slender, not viscid-hairy . . . . . **2. G. richardsonii.**
Petals pinkish purple; plants stout, covered with very sticky hairs.
3. G. viscosissimum.

1. Geranium bicknellii Britton. CRANE'S-BILL. Woods or thickets at low and middle altitudes; scarce. B. C. and Wash. to Utah, N. Y., and N. S.—Plants 20 to 50 cm. high, often much branched, finely hairy; flowers few, small and inconspicuous.

This species has the appearance of being an introduced plant, for it is usually found in waste places or along trails.

2. Geranium richardsonii Fisch. & Trautv. WHITE GERANIUM. Frequent on the east slope at low altitudes, usually in aspen thickets. B. C. to Calif., N. Mex., and S. Dak.—Plants 30 to 60 cm. high, more or less hairy; petals 15 to 20 mm. long.

The flowers are not conspicuous.

3. Geranium viscosissimum Fisch. & Mey. PURPLE GERANIUM. Common on the east slope at low altitudes, chiefly in woods or thickets. B. C. to Calif., Colo., and S. Dak.—Plants 20 to 60 cm. high, very viscid; petals about 2 cm. long.

A handsome plant when in full flower. In late summer the leaves are beautifully colored with red.

47. LINACEAE. Flax Family.

1. LINUM L.

Glabrous erect annuals or perennials; leaves alternate, entire, sessile; flowers large, blue, in racemes or panicles; petals 5; stamens 5; fruit a 5-celled capsule.

Plants annual; inner sepals with short hairs on the margins . . **1. L. usitatissimum.**
Plants perennial; sepals without hairs . . . . . **2. L. lewisii.**

1. Linum usitatissimum L. FLAX. A few plants found along the railroad at the east entrance. Native of Eur.; cultivated and frequently escaping.—Stems 20 to 80 cm. high; leaves lance-linear, 3-nerved; petals 1 to 1.5 cm. long.

2. Linum lewisii Pursh. WILD FLAX. Frequent in open places, usually at low altitudes, but sometimes found above timber line. Alaska to Calif., Mex., and Nebr.—Stems 20 to 60 cm. high, branched from the base, pale green; leaves linear, 1 to 2 cm. long; petals 1.5 to 2 cm. long.

A very showy plant with beautiful blue flowers. The petals usually fall when the flowers are picked. Wild flax belongs properly in the prairie region but, like so many other prairie plants, it is found occasionally above timber line, as at Cracker Lake.

48. EUPHORBIACEAE. Spurge Family.

1. EUPHORBIA L.

1. Euphorbia glyptosperma Engelm. CREEPING SPURGE. Dry soil about Belton; apparently introduced. B. C. to Mex., Mo., and Ont. (*Chamaesyce glyptosperma* Small.)—Prostrate annual, glabrous or nearly so; leaves opposite, oblong, 4 to 12 mm.

long, finely toothed; flowers very small, greenish, surrounded by a small involucre, borne in the leaf axils; fruit a 3-seeded capsule about 2 mm. thick.

An inconspicuous plant with milky juice. Some of the related species have a wide reputation in the Southwest as a remedy for rattlesnake bites.

49. CALLITRICHACEAE. Water Starwort Family.

1. CALLITRICHE L. Water starwort.

Aquatic perennials; leaves opposite, entire; flowers minute, sessile in the leaf axils; calyx and corolla none; stamen 1; fruit small, 4-lobed, leathery.

Upper leaves spatulate, 3-nerved; flower with a pair of bracts at the base.
1. C. palustris.

Upper leaves (like the others) linear, 1-nerved; flowers without bracts.
2. C. autumnalis.

1. Callitriche palustris L. East entrance, in pools. Widely distributed in N. and S. Amer., Eur., and Asia.—Stems usually floating, 3 to 20 cm. long; lower leaves sessile, linear, 1 to 1.5 cm. long, the floating leaves petioled, 5 to 10 mm. long; fruit about 1.5 mm. long.

2. Callitriche autumnalis L. Occasional in pools or sometimes on mud. Oreg. to Colo., N. Y., and Que.; also in Eur.—Stems slender, 3 to 20 cm. long; leaves 5 to 15 mm. long, notched at the apex; fruit 1 to 2 mm. broad.

50. CELASTRACEAE. Bittersweet Family.

1. PACHISTIMA Raf.

1. Pachistima myrsinites (Pursh) Raf. Mountain lover. Abundant on the west slope and in some localities on the east slope, usually in woods. B. C. to Calif. N. Mex., and Alta.—Shrub, 20 to 60 cm. high; leaves opposite, evergreen, oval or obovate, 1 to 3 cm. long, somewhat toothed; flowers small, green, clustered in the leaf axils; petals 4; fruit a small 2-celled capsule.

Rare in the Many Glacier region, but the shrub grows in one place along the trail to Swiftcurrent Pass; plentiful about Sun Camp. It is an inconspicuous and unattractive plant, with erect or sometimes prostrate branches.

51. ACERACEAE. Maple Family.

1. ACER L. Maple.

1. Acer douglasii Hook. Mountain maple. Common at low and middle altitudes, usually in woods or thickets, sometimes on open slopes. B. C. to Oreg., Wyo., and Alta.—Shrub, or a small slender tree with smooth gray bark; leaves opposite, slender-petioled, 3 to 10 cm. long and about as broad, glabrous, 3 or 5-lobed and toothed, on young branches often divided into 3 leaflets; fruit of 2 samaras, these 3 to 4 cm. long.

The plants are very variable in size and in form of the leaves. In exposed places the plants are usually shrubs, about a meter high, forming large clumps, or small trees. In woods they are more often slender trees. The leaves are often covered with showy, bright red galls. It is doubtful whether *A. douglasii* is more than a form of *A. glabrum* Torr.

52. RHAMNACEAE. Buckthorn Family.

Fruit juicy; flowers green, clustered in the axils of the leaves . . . . **1. RHAMNUS.**
Fruit dry; flowers white, in panicles . . . . . **2. CEANOTHUS.**

1. RHAMNUS L.

1. Rhamnus alnifolia L'Hér. BUCKTHORN. Common at low and middle altitudes, in woods, on open slopes, or in swamps. B. C. to Calif., N. J., and Me.—Shrub, 0.6 to 1.2 meters high; leaves alternate, oval or elliptic, 3 to 8 cm. long, obtuse or acute, toothed, nearly glabrous; flowers very small and inconspicuous; fruit black, 3-seeded, very bitter.

A characteristic shrub, often forming low thickets. The leaves turn yellow in autumn. The name buckthorn is not very appropriate, for the plant has no thorns. A related species, common on the Facific coast and extending also into Montana (*Rhamnus purshiana*), furnishes the cascara sagrada which is used in medicine.

2. CEANOTHUS L.

Low shrubs with alternate 3-ribbed leaves; flowers small, in dense rounded panicles; petals 5; capsule 3-celled.

Leaves thick, pale and finely velvety-hairy on the under surface; flower panicles on leafy stalks . . . . . **1. C. velutinus.**

Leaves thin, green and nearly glabrous on the under surface; panicles often on naked stalks . . . . . **2. C. sanguineus.**

1. Ceanothus velutinus Dougl. DEERBRUSH. Frequent at low or middle altitudes, usually on open rocky slopes. B. C. to Colo. and S. Dak.—Shrub, 0.6 to 1.5 meters high, with green twigs; leaves 4 to 7 cm. long, finely toothed.

The leaves are bright green on the upper surface and appear as if varnished. The flowers appear early in the season.

2. Ceanothus sanguineus Pursh. SNOWBRUSH. Brushy hillsides about Belton. Mont. to Calif. and B. C.—Slender shrub, about a meter high; older branches red or purple; leaves oval, rounded at the apex, finely toothed.

This shrub is closely related to the New Jersey tea (*Ceanothus americanus*) of the Eastern States, whose leaves were used as a substitute for Chinese tea during the Revolutionary War.

53. MALVACEAE. Mallow Family.

The cultivated althaea, hibiscus, hollyhocks, okra, and cotton belong to the mallow family.

1. SPHAERALCEA St. Hil.

1. Sphaeralcea rivularis Dougl. WILD HOLLYHOCK. Common on the east slope, chiefly at low altitudes; in woods, especially among aspens, or at the edges of streams. B. C. to Colo. and S. Dak.—Coarse perennial herb, 0.6 to 1.5 meters high, covered with branched hairs; leaves alternate, 5 to 12 cm. long, 5 or 7-lobed; flowers clustered in the axils of the upper leaves, delicate pink; petals 5, about 2 cm. long; fruit composed of several cells, these falling apart like the sections of an orange.

The flowers are very handsome, but they last only a short time. The fruit is covered with stiff hairs, which penetrate the skin easily.

54. HYPERICACEAE. St. John's-wort Family.

1. HYPERICUM L.

1. Hypericum scouleri Hook. ST. JOHN'S-WORT. Abundant, chiefly at high and middle altitudes, in moist places; common in alpine meadows. B. C. to Calif., Wyo., and Mont.—Glabrous perennial herb, 10 to 30 cm. high; leaves opposite, entire, sessile, 1 to 2 cm. long, black-dotted; flowers bright yellow, in cymes; petals 5, 8 to 10 mm. long; stamens numerous; fruit a 3-lobed capsule.

The plants often form dense clumps, which are covered with the golden flowers. The buds are tinged with red.

55. VIOLACEAE. Violet Family.

1. VIOLA L. Violet.

Perennial herbs, stemless or with leafy stems; flowers stalked in the leaf axils; petals 5, the lowest one spurred; stamens 5; fruit a small capsule.

Leaves acute at the base; flowers yellow . . . . . **1. V. linguaefolia.**
Leaves cordate or rounded at the base; flowers variously colored.
Plants stemless, sometimes sending out runners.
Flowers yellow; leaves broadly rounded at the apex, dark green, usually lying flat on the ground . . . . . **2. V. orbiculata.**
Flowers white, lilac, or purple; leaves often pointed, not dark green, erect.
Plants with slender runners; petals white or lilac . . . . . **3. V. palustris.**
Plants without runners; petals purple . . . . . **4. V. nephrophylla.**
Plants with short or tall leafy stems.
Flowers purple; leaves rounded or truncate at base.
Leaves 1 to 3 cm. long; seeds 1.5 mm. long . . . . . **5. V. adunca.**
Leaves 3 to 5 cm. long; seeds 2 mm. long . . . . . **6. V. montanensis.**
Flowers yellow or lavender; leaves cordate at base.
Petals yellow; leaves usually glabrous beneath . . . . . **7. V. glabella.**
Petals lavender inside; leaves usually short-hairy beneath on the veins. **8. V. canadensis.**

1. Viola linguaefolia Nutt. East entrance, on canyon slopes, *Umbach.* Wash. to Calif., Colo., and Mont.—Plants with short stems; leaves mostly ovate or elliptic, 4 to 8 cm. long, obtuse or acutish, glabrous or nearly so; upper petals reddish brown.

2. Viola orbiculata Geyer. EVERGREEN VIOLET. Frequent at low and middle altitudes, rarely found above timber line, usually in deep woods. B. C., Wash., Mont., and Alta.—Rootstocks thick and stout; leaves rounded, 2 to 4 cm. wide, with low rounded teeth, glabrous or nearly so; runners 5 to 10 cm. long, usually flower-bearing.

The leaves are of a darker green than those of most violets; they persist through the winter.

3. Viola palustris L. MARSH VIOLET. Frequent at low and middle altitudes, in swamps or wet thickets; common in sphagnum bogs. Alaska to Colo., S. Dak., N. H., and Lab.; also in Eur. and Asia.—Plants glabrous, with slender rootstocks; leaves heart-shaped or rounded, with low teeth; seeds dark brown.

4. Viola nephrophylla Greene. PURPLE VIOLET. Occasional in moist woods or on lake shores. B. C. to N. Mex., Wis., Conn., and Que.—Plants with thick rootstocks; eaves heart-shaped or kidney-shaped, 3 to 6 cm. wide; seeds olive-brown, 2 mm. long.

5. Viola adunca J. E. Smith. Rocky summit above Ptarmigan Lake; also collected by Umbach on hills at east entrance. Alaska to Calif., Colo., N. H., and Que.—Stems often very short; leaves ovate, obtuse, finely hairy; spur slender, 5 to 7 mm. long.

6. Viola montanensis Rydb. East entrance, on hillsides, *Umbach.* Mont. to Colo.—Stems 10 to 20 cm. high; leaves broadly ovate, often finely hairy.

Perhaps only a form of *V. adunca.*

7. Viola glabella Nutt. YELLOW VIOLET. Common at middle altitudes and sometimes above timber line, in woods or on moist slopes. Alaska to Calif. and Mont.—Plants 10 to 30 cm. high, nearly glabrous; leaves mostly kidney-shaped, crenate, usually short-pointed; seeds nearly black.

This is the only violet which is seen in bloom in any abundance during the summer. The plants often form great beds on banks near snow about timber line.

8. Viola canadensis L. CANADA VIOLET. Occasional at low altitudes, in woods or thickets. B. C. to Ariz., S. C., and N. B.—Stems 15 to 30 cm. high, usually finely hairy; leaves kidney-shaped or broadly heart-shaped, 4 to 10 cm. wide, short-pointed; seeds brown.

The Canada violet blooms in spring, but scattered plants blossom in late summer.

56. LOASACEAE. Loasa Family.

1. MENTZELIA L.

1. Mentzelia dispersa S. Wats. STICKLEAF. Prairie and dry banks at the east entrance. B. C. to Calif., Colo., and Mex. (*Acrolasia dispersa* Rydb.)—Annual, 25 to 40 cm. high, densely branched; leaves alternate, lanceolate, entire or toothed, very rough with short hairs; petals 5, pale dull yellow, 3 to 4 mm. long.

The leaves adhere tenaciously to clothing.

57. ELAEAGNACEAE. Oleaster Family.

Shrubs; pubescence of scales or of branched hairs; leaves entire; flowers in axillary clusters, small; sepals 4; petals none; fruit drupelike, 1-seeded.

Leaves alternate; stamens 4 . . . . . **1. ELAEAGNUS.**
Leaves opposite; stamens 8 . . . . . **2. LEPARGYREA.**

1. ELAEAGNUS L.

1. Elaeagnus commutata Bernh. SILVERBERRY. Frequent at low altitudes, on dry rocky hillsides, on shale slopes, or in rocky stream beds. Yukon to Utah, Minn., and Que. (*Elaeagnus argentea* Pursh.)—Slender shrub, 0.6 to 2 meters high, with reddish brown bark; leaves oblong, 2 to 10 cm. long, densely covered with silvery scales; flowers yellowish green, fragrant; fruit 8 to 12 mm. long, covered with silvery scales.

There are extensive thickets of this shrub along the creek at St. Mary. The fruit has thin, nearly dry flesh, and is not edible.

2. LEPARGYREA Raf.

1. Lepargyrea canadensis (L.) Greene. CANADA BUFFALOBERRY. PLATE 51, A. Common at low and middle altitudes, in woods or on open slopes. Alaska to Oreg., N. Mex., N. Y., and Newf. (*Shepherdia canadensis* Nutt.)—Shrub, 0.6 to 1.5 meters high, densely branched, often forming broad clumps; leaves oval or ovate, green on the upper surface, beneath silvery-scaly and brown-scurfy; flowers greenish yellow; fruit bright red, very juicy.

When in flower, in spring, the shrub is not conspicuous, but in middle or late summer, when loaded with fruit, it is one of our most showy and attractive plants. The fruit when tasted is at first sour and rather pleasant, but after a moment is intensely bitter. The common buffaloberry, *Lepargyrea argentea* (Nutt.) Greene, grows along streams in the plains region of Montana. Its fruit resembles that of the Canada buffaloberry, but it is edible and not bitter.

58. ONAGRACEAE. Evening-primrose Family.

Annual or perennial herbs; leaves alternate or opposite; flowers borne in the axils of the leaves or arranged in racemes; sepals 4 or rarely 2; petals 4 or 2; fruit a capsule, or nutlike.

Petals and sepals each 2; fruit covered with small hooked hairs . . . **1. CIRCAEA.**
Petals and sepals each 4; fruit without hooked hairs.
  Plants stemless or nearly so, the leaves forming a rosette.
    Petals about 5 mm. long; stigma not lobed . . . . . **3. TARAXIA.**

Petals 1.2 to 4 cm. long; stigma with 4 long lobes.
Petals yellow; capsule with narrowly winged angles . . . . . **4. LAVAUXIA.**
Petals white; capsule with 2 low crests along each angle. **5. PACHYLOPHUS.**

Plants with leafy stems.
Seeds each with a tuft of silky hairs at one end; leaves opposite or alternate. **2. EPILOBIUM.**

Seeds glabrous; leaves alternate.
Petals 1.2 to 3 cm. long, white or yellow.
Petals yellow; stems hairy . . . . . **6. OENOTHERA.**
Petals white; stems glabrous or nearly so . . . . . **7. ANOGRA.**
Petals 1 to 6 mm. long, pink to purplish red, rarely white.
Plants perennial; petals 4 to 6 mm. long; fruit nutlike, not opening. **8. GAURA.**
Plants annual; petals 1 to 3 mm. long; fruit opening when ripe.
Calyx with a short tube; capsules sessile . . . . . **9. BOISDUVALIA.**
Calyx without a tube; capsules stalked . . . . . **10. GAYOPHYTUM.**

1. CIRCAEA L. Enchanter's nightshade.

Perennials, glabrous or nearly so; leaves opposite, petioled, broadly ovate, thin; flowers very small, white, in racemes; petals notched, about 1.5 mm. long; fruit obovoid, covered with whitish hooked hairs.—The fruits adhere to clothing readily. The roots bear cylindric watery tubers.

Leaves sharply toothed, usually cordate at base . . . . . **1. C. alpina.**
Leaves entire or with very short sinuate teeth, rounded or truncate at base. **2. C. pacifica.**

1. Circaea alpina L. Occasional at low or middle altitudes, in moist woods. Widely distributed in N. Amer., Eur., and Asia.—Stems weak, simple, 5 to 20 cm. high; leaves 2 to 5 cm. long; fruit about 2 mm. long.

2. Circaea pacifica Aschers. & Magn. Frequent, chiefly at middle altitudes, in moist woods or thickets. B. C. to Calif., Colo., and Mont.—Stems 15 to 40 cm. high, weak and succulent; leaves 3 to 6 cm. long, thin; fruit 2 to 3 mm. long.

2. EPILOBIUM L. Cottonweed.

Annual or perennial herbs; leaves alternate or opposite, entire or toothed; flowers in racemes or solitary in the leaf axils; stamens 8; fruit a long slender capsule; seeds with a tuft of white hairs at the upper end.

Petals 10 to 30 mm. long, rounded at the summit.
Leaves bright green on the upper surface, pale beneath; plants usually 0.5 to 1.5 meters high; flowers in long naked racemes . . . . . **1. E. angustifolium.**
Leaves glaucous; plants 10 to 40 cm. high; flowers in short leafy racemes. **2. E. latifolium.**

Petals 3 to 7 mm. long, notched.
Plants annual; leaves mostly linear . . . . . **3. E. adenocladon.**
Plants perennial; leaves broader than linear.
Leaves with fine but conspicuous sharp teeth; plants 30 to 60 cm. high, lower only if stunted.
Petals about 7 mm. long . . . . . **4. E. glandulosum.**
Petals 3 to 5 mm. long . . . . . **5. E. adenocaulon.**
Leaves entire or with a few low blunt teeth; plants nearly always less than 30 cm. high.
Stems densely covered to the base with fine gland-tipped hairs; leaves finely hairy . . . . . **6. E. mirabile.**

Stems glabrous below or with minute curled or appressed hairs; leaves mostly glabrous.
Leaves sessile, glaucous . . . . . **7. E. platyphyllum.**
Leaves short-petioled, green.
Petals white . . . . . **8. E. alpinum.**
Petals purple or pink.
Petals 6 to 7 mm. long; plants with scaly underground shoots. **9. E. hornemannii.**
Petals 4 to 5 mm. long; plants with short sterile leafy shoots above ground.
Seeds smooth; capsule long-cylindric . . . . . **10. E. anagallidifolium.**
Seeds finely roughened; capsule somewhat club-shaped. **11. E. clavatum.**

1. Epilobium angustifolium L. FIREWEED. Abundant at low and middle altitudes, chiefly on open slopes, often in woods. Widely distributed in N. Amer., Eur., and Asia. (*Chamaenerion angustifolium* Scop.; *C. spicatum* S. F. Gray.)—Perennial, glabrous or nearly so; stems simple or branched; leaves lanceolate or linear-lanceolate, 5 to 15 cm. long, entire; petals rose-purple, 1 to 2 cm. long; capsules 5 to 8 cm. long, slender.

One of the showiest plants of the park, often occurring in great abundance, and continuing in flower for a long time. There is a particularly fine display along the automobile road on the east slope, and the plant is nearly always abundant in burns. The stems, leaves, and capsules are soon brilliantly tinged with red and purple. The name "fireweed" is due to the fact that the plant is one of the first to spring up in burned-over areas. This, of course, happens because the seeds are easily transported by wind. Fireweed grows in the Eastern States, but there it seldom forms such wonderful displays of color as are found in the West.

2. Epilobium latifolium L. ALPINE FIREWEED. Common above timber line, on rocky slopes and rock slides; often found abundantly along streams at middle or even at low altitudes. Alaska to Wash., Colo., S. Dak., Que., and Greenl.; also in Eur. and Asia. (*Chamaenerion latifolium* Sweet.)—Perennial, 10 to 40 cm. high, often forming dense clumps; leaves ovate or lanceolate, entire, 2 to 5 cm. long, covered with fine hairs; flowers crowded at the ends of the stems; petals rose-purple, 1.5 to 3 cm. long; capsule 5 to 8 mm. long.

A very beautiful plant, but not forming such extensive masses of color as the common fireweed, with which it frequently grows. It reaches its best development along streams at middle elevations, where it often forms great banks of rich color. Plants collected at St. Mary are remarkable for their linear-lanceolate leaves.

3. Epilobium adenocladon (Hausskn.) Rydb. Occasional at low altitudes on open or brushy slopes or sandbars. Mont. to Colo. and S. Dak.—Stems slender, 20 to 60 cm. high, glabrous below, branched; leaves mostly entire, 2 to 4 cm. long; petals pink or purplish, about 5 mm. long; capsule 1.5 to 2.5 cm. long, covered with fine gland-tipped hairs.

4. Epilobium glandulosum Lehm. Occasional at middle altitudes, on brushy slopes or along brooks. Alaska to Wyo. and Sask.—Stems 30 to 60 cm. high, mostly simple, finely pubescent above; leaves lance-ovate, 3 to 6 cm. long, sessile, finely toothed; petals purple; capsules 3 to 6 cm. long, finely pubescent.

5. Epilobium adenocaulon Hausskn. Common at low and middle altitudes, in moist woods or thickets. Yukon to Nev., N. Mex., Pa., and N. B.—Stems 30 to 80 cm. high, simple or branched, finely hairy above; leaves lanceolate or ovate, 2 to 6 cm. long, usually short-petioled, glabrous or nearly so; petals pink or purple; capsules 3 to 5 cm. long, nearly glabrous.

6. Epilobium mirabile Trel. Frequent above timber line, on moist slopes or along brooks; sometimes about snow banks at middle altitudes. Wash. and Mont.—Stems 10 to 25 cm. high, forming dense clumps; leaves ovate, 1 to 2 cm. long, remotely toothed; petals pink, about 5 mm. long; capsule 2 to 4 cm. long.

This species has been known previously only from the original collection, from Mount Rainier, Washington. A specimen collected in Glacier Park by Umbach and listed by Rydberg under *E. palmeri* Rydb. belongs here.

7. Epilobium platyphyllum Rydb. Occasional at low or middle altitudes, on moist slopes or on lake beaches or sandbars. B. C. to Calif., Utah, and Mont.—Stems 10 to 20 cm. high, glabrous, forming dense tufts; leaves ovate, 1.5 to 2.5 cm. long, entire or nearly so, glabrous; petals 4 to 5 mm. long, pink or purple; capsules glabrous, 3 to 5 cm. long.

8. Epilobium alpinum L. Common above timber line, in meadows or on rocky slopes; frequently found at middle altitudes, in wet thickets or on moist cliffs. Alaska to Calif., Colo., S. Dak., N. H., and Greenl.; also in Eur. and Asia.—Stems slender, 10 to 20 cm. high, tufted, usually glabrous; leaves ovate, 1 to 3 cm. long, entire or nearly so; petals 3 to 5 mm. long; capsules 3 to 5 cm. long.

9. Epilobium hornemannii Reichenb. Common above or near timber line, in moist meadows or on slopes; occasional in wet places at middle altitudes. Alaska to Calif., Colo., S. Dak., N. H., and Greenl.; also in Eur. and Asia.—Stems slender, 10 to 30 cm. high, tufted, finely pubescent; leaves oblong to ovate, 1.5 to 4 cm. long, obtuse; capsules 3 to 5 cm. long, slender-stalked.

A handsome plant when in full flower.

10. Epilobium anagallidifolium Lam. Frequent above timber line, in meadows or on rocky slopes or rock slides; sometimes in wet places at middle altitudes. Alaska to Colo., Lab., and Greenl.; also in Eur. and Asia.—Stems slender, 10 to 15 cm. high, minutely pubescent, tufted; leaves oblong to ovate, 1 to 2 cm. long, obtuse, entire or nearly so; capsules 2 to 4 cm. long, slender-stalked.

11. Epilobium clavatum Trel. Occasional above timber line, in meadows or on slopes; sometimes in wet places at middle altitudes. B. C. and Alta. to Colo.—Stems slender, about 10 cm. high, nearly glabrous, tufted; leaves oval or ovate, obtuse, 1 to 2 cm. long, entire or nearly so; capsules 2 to 3 cm. long, slender-stalked.

3. TARAXIA Nutt.

1. Taraxia breviflora Nutt. Low places on prairie near east entrance. B. C. and Alta. to Utah. (*Oenothera breviflora* Torr. & Gray.)—Stemless perennial; leaves spreading upon the ground, 5 to 10 cm. long, lobed, finely hairy; petals yellow, 5 mm. long; capsule roughened, 1.5 cm. long.

4. LAVAUXIA Spach.

1. Lavauxia flava A. Nels. East entrance, on prairie, *Umbach*. Wash. to Calif., N. Mex., and Nebr.—Stemless perennial, nearly glabrous; leaves oblanceolate, 10 to 20 cm. long, lobed, at least near the base; flowers sessile; petals 1.5 to 2 cm. long, yellow, turning pink; capsule 2 to 3 cm. long.

5. PACHYLOPHUS Spach.

1. Pachylophus caespitosus (Nutt.) Raim. PRAIRIE EVENING-PRIMROSE. East entrance, on shale slopes or prairie. Sask. to Utah, N. Mex., and Nebr. (*Oenothera caespitosa* Nutt.)—Perennial, stemless or nearly so, forming dense tufts, glabrous; leaves oblanceolate, 10 to 20 cm. long, toothed; petals 3 to 4 cm. long, white, turning deep pink; capsule about 3 cm. long.

The flowers open in the evening and close in the morning; they are very showy.

6. OENOTHERA L.

1. Oenothera strigosa (Rydb.) Mack. & Bush. EVENING-PRIMROSE. Rare; at low altitudes, on dry slopes; perhaps introduced. B. C. to Utah, Kans., and Minn.—Plants biennial, 0.4 to 1 meter high, hairy; leaves spatulate or lanceolate, 5 to 10 cm. long, with low teeth; flowers sweet-scented, in leafy spikes; petals 12 to 20 mm. long, pale yellow; capsule 2.5 to 3 cm. long, cylindric.

7. ANOGRA Spach.

1. Anogra nuttallii (Sweet) A. Nels. East entrance, on dry bluffs, *Umbach*. B. C. to Colo. and Minn. (*Oenothera albicaulis* Nutt.)—Perennial, 30 to 60 cm. high, branched, with whitish stems; leaves linear or linear-oblong, 3 to 10 cm. long, entire or with distant teeth, finely hairy beneath; flowers sessile in the leaf axils; petals about 2 cm. long, white, turning pink; capsule 2 to 3 cm. long, cylindric.

8. GAURA L.

1. Gaura coccinea L. BUTTERFLY PLANT. Occasional on prairie or dry slopes at east entrance. Mont. to S. Dak. and Mex.—Branched perennial, 10 to 40 cm. high, hairy; leaves oblong or lanceolate, 1 to 3 cm. long, entire or shallowly toothed; flowers in slender spikes; petals 4 to 6 mm. long, pink or red; fruit 4-angled, nutlike, 5 to 7 mm. long.

One of the most characteristic plants of the Great Plains region.

9. BOISDUVALIA Spach.

1. Boisduvalia glabella (Nutt.) Spach. East entrance, abundant about dried-up pools on prairie. B. C. to Calif. and Sask.—Annual, 10 to 30 cm. high, simple or branched, finely hairy or nearly glabrous; leaves sessile, ovate, 7 to 17 cm. long, acute, finely toothed or entire; flowers sessile in the leaf axils; petals 2 mm. long, pink; capsule 5 to 7 mm. long.

10. GAYOPHYTUM Juss.

Slender branched annuals, glabrous or nearly so; leaves linear, entire; flowers very small, in the leaf axils; capsule linear or club-shaped.—In general appearance the plants resemble closely the annual species of *Epilobium*.

Capsule several times as long as its stalk . . . . . **1. G. racemosum.**
Capsule less than 3 times as long as its stalk . . . . . **2. G. intermedium.**

1. Gayophytum racemosum Torr. & Gray. East entrance, on dry hills, *Umbach*. Wash. to Calif., Colo., and S. Dak.—Stems 10 to 30 cm. high; leaves 1 to 2 cm. long; petals white or pink, 1 mm. long; capsules 1 to 1.5 cm. long.

2. Gayophytum intermedium Rydb. Dry slopes, at east entrance and Summit, *Umbach*. Wash. to Calif., Colo., and Mont.—Stems 15 to 40 cm. high; leaves 1 to 4 cm. long; petals 1.5 to 2.5 mm. long, pink, with yellow base; capsules 5 to 10 mm. long.

59. HALORAGIDACEAE. Water Milfoil Family.

Perennial aquatic herbs; leaves whorled; flowers small, green, sessile in the leaf axils; fruit a nutlet.

Leaves mostly divided into threadlike lobes; flowers with 2 to 4 sepals and 2 to 4 small petals . . . . . **1. MYRIOPHYLLUM.**
Leaves entire; sepals and petals none . . . . . **2. HIPPURIS.**

1. MYRIOPHYLLUM L.

1. Myriophyllum spicatum L. WATER MILFOIL. East entrance, in ponds, *Umbach*. Alaska to Calif., N. Mex., Kans., Conn., and Newf.—Stems submerged, branched; leaves in whorls of 4 or 5, 1 to 3 cm. long; floral leaves ovate, entire or toothed, very small.

2. HIPPURIS L.

1. **Hippuris vulgaris** L. MARE'S-TAIL. About ponds or dried-up pools on prairie about the east entrance. Widely distributed in N. Amer., Eur., and Asia.—Glabrous perennial, 20 to 70 cm. high, with unbranched stems; leaves in whorls of 6 to 12, linear, acute, entire; flowers very small, green, sessile in the leaf axils.

60. ARALIACEAE. Ginseng Family.

Ginseng (*Panax quinquefolium* L.) is one of the best-known plants of this family. It is a native of the eastern United States.

Plants shrubby, armed with prickles . . . . . **1. ECHINOPANAX.**
Plants herbaceous, unarmed . . . . . **2. ARALIA.**

1. ECHINOPANAX Decaisne & Planch.

1. **Echinopanax horridum** (J. E. Smith) Decaisne & Planch. DEVIL'S-CLUB. Common on the west slope at low altitudes, in moist woods and thickets; reported from the east slope, but certainly rare. Alaska to Oreg., Mont., and Mich. (*Fatsia horrida* Benth. & Hook.)—Shrub, 1 to 2 meters high, the stems and under surfaces of the leaves covered with long prickles; leaves very large, lobed and toothed; flowers small, greenish white, in small umbels arranged in a panicle; fruit bright red, juicy, not edible.

One of the characteristic shrubs of the west slope, often forming extensive and almost impenetrable thickets. The plant has a strong odor. The large leaves remind one of those of some tropical plants. The panicles of fruit are usually large, dense, and very heavy.

2. ARALIA L.

1. **Aralia nudicaulis** L. WILD SARSAPARILLA. Common at low altitudes on the west slope, in woods or on brushy hillsides. B. C. to Colo., N. C., and Newf.—Plants glabrous, 30 to 60 cm. high; leaf rising directly from the rootstock, composed of several leaflets, these 5 to 10 cm. long, finely toothed; flowers small, greenish, usually arranged in 3 umbels on a naked stalk; fruit purplish black, juicy, not edible.

In autumn the leaves turn pink or deep red. The rootstocks have properties similar to those of sarsaparilla and are employed in medicine. The true sarsaparilla of commerce is obtained from tropical American species of *Smilax*.

61. APIACEAE. Parsley Family.

Annual or perennial herbs, often with a strong odor; stems usually hollow; leaves alternate, commonly compound, the petiole broadened at its base; flowers small, in simple or compound umbels, rarely in heads; sepals 5, usually very small; petals 5; stamens 5; fruit of 2 one-seeded carpels, these at first attached to each other but finally separating.—The names Umbelliferae and Ammiaceae are sometimes used for the group. Cultivated parsley, carrots, caraway, dill, and celery belong to this family. The flowers are usually in small umbels which are arranged in large umbels; at the base of the large umbel there is often an *involucre* of *bracts*, and at the base of the smaller umbels an *involucel* of *bractlets*.

Lowest (or all) leaves simple, entire or toothed.
  Leaves all entire, pale green . . . . . **1. BUPLEURUM.**
  Leaves not entire, the lowest ones heart-shaped and toothed, the upper ones compound (composed of several leaflets) . . . . . **2. ZIZIA.**
Lowest leaves (like the upper ones) compound, composed of 3 to many leaflets.
  Fruit covered with short hooked spines; leaflets 3 or 5, all attached at the end of the leaf stalk . . . . . **3. SANICULA.**
  Fruit not spiny; leaflets 3 or more, not all attached at the end of the leaf stalk.
    Fruit linear or nearly so, several times as long as broad.
      Fruit with appressed bristly hairs on the ribs; flowers white. **4. OSMORRHIZA.**
      Fruit glabrous; flowers pale yellow . . . . . **5. GLYCOSMA.**

Fruit oblong to rounded, less than 3 times as long as broad.
Ribs of the fruit not winged; flowers white or pink; plants glabrous.
Leaflets, at least those of the upper leaves, linear or threadlike, entire.
6. CARUM.
Leaflets lanceolate to linear, toothed.
Ribs of the fruit equal and prominent; leaves once pinnate . . **7. SIUM.**
Ribs of the fruit unequal, those on the back of the carpel low and broad, those on the side prominent and thick; leaves twice pinnate or 2 or 3 times ternate . . . . . **8. CICUTA.**
Ribs of the fruit, at least some of them, winged; flowers white or yellow; plants glabrous or hairy.
Leaflets 10 to 30 cm. wide, few; plants very hairy, usually a meter high or taller . . . . . **9. HERACLEUM.**
Leaflets smaller, mostly less than 5 cm. wide, usually numerous; plants glabrous or very finely hairy.
Leaves once pinnate; flowers yellow . . . . . **10. PASTINACA.**
Leaves 2 or more times pinnate or ternate; flowers yellow or white.
Leaflets entire; flowers yellow . . . . . **11. COGSWELLIA.**
Leaflets toothed or lobed; flowers yellow or white.
Plants glabrous; flowers yellow or white . . . . . **12. ANGELICA.**
Plants finely hairy, at least on the leaves; flowers yellow.
Wings at the edges of the carpels thin, not corky; leaves mostly small. . . . . **11. COGSWELLIA.**
Wings thick and corky; leaves broad . . . . . **13. LEPTOTAENIA.**

1. BUPLEURUM L.

1. Bupleurum americanum Coult. & Rose. Frequent on the east slope at low altitudes, on dry open hillsides or on dry or wet prairie. Alaska to Wyo.—Perennial, 10 to 30 cm. high, glabrous and glaucous; leaves entire, oblong or linear-lanceolate, parallel-veined; flowers yellow; involucels of 5 or more ovate bractlets; fruit 5 mm. long, somewhat flattened from the sides, with slender ribs.

2. ZIZIA Koch.

1. Zizia cordata (Walt.) Koch. MEADOW PARSNIP. Low meadows and prairie at St. Mary and east entrance. B. C. to Oreg., Utah, Ga., and Conn.—Glabrous perennial, 20 to 60 cm. high; basal leaves heart-shaped 2 to 8 cm. long, with rounded teeth; stem leaves with 3 ovate or lanceolate, toothed leaflets; flowers yellow; bracts none, the bractlets small; fruit 3 mm. long, somewhat flattened from the sides, with slender ribs.

3. SANICULA L.

1. Sanicula marilandica L. BUR SNAKEROOT. Frequent at low and middle altitudes, especially on the west slope, usually in wet thickets. B. C. and Wash. to Colo., Ga., and Newf.—Glabrous perennial, 30 to 60 cm. high, with rootstocks; basal leaves long-stalked, composed of 3 leaflets, the 2 outer ones deeply 2-lobed; leaflets 5 to 8 cm. long, cut and toothed; flowers greenish yellow, in headlike clusters; fruit 6 to 7 mm. long, covered with hooked bristles.

The fruits cling readily to clothing.

4. OSMORRHIZA Raf. SWEET CICELY.

Perennials with thick strong-scented roots; leaves 3-parted, the leaflets thin, lobed or toothed; flowers few, white, in small umbels; involucre wanting or of 1 or 2 small bracts; fruit linear or club-shaped, bristly.

Pedicels longer than the fruit . . . . . **1. O. divaricata.**
Pedicels shorter than the fruit . . . . . **2. O. brevipes.**

1. Osmorrhiza divaricata Nutt. Common on the east slope at low and middle altitudes, usually in moist woods or thickets. B. C. to Oreg. and S. Dak.; also in Que.—Stems slender, 20 to 60 cm. high, hairy or almost glabrous; leaflets 2 to 6 cm. long, pubescent; fruit 12 to 15 mm. long.

2. Osmorrhiza brevipes (Coult. & Rose) Suksdorf. Frequent at low and middle altitudes, in moist woods.—Plants 30 to 70 cm. high, branched, hairy; leaflets 2 to 6 cm. long, coarsely toothed; fruit about 15 mm. long.

5. GLYCOSMA Nutt.

1. Glycosma occidentalis Nutt. Common on the east slope at low and middle altitudes, in woods or thickets, especially in moist places; often in wet meadows above timber line. B. C. to Calif., Colo., and Alta.—Perennial, 0.5 to 1 meter high, finely hairy; leaves 2 or 3 times divided, the leaflets oblong-lanceolate, 3 to 10 cm. long, toothed; flowers pale yellow or nearly white; fruit narrowly club-shaped, 12 to 20 mm. long, smooth.

The plant, especially the root, has a strong and characteristic odor.

6. CARUM L.

Biennials or perennials, glabrous; leaves divided into linear or threadlike lobes or once pinnate; involucres and involucels of slender bracts and bractlets; fruit glabrous, somewhat flattened from the sides.

Leaves once pinnate; roots tuberous, clustered; fruit about 2 mm. long. **1. C. gairdneri.**

Leaves 3 or 4 times lobed; plants with a taproot; fruit about 4 mm. long. **2. C. carui.**

1. Carum gairdneri (Hook. & Arn.) A. Gray. YAMPA. Occasional on the east slope at low altitudes, in moist meadows or thickets. B. C. to Calif., N. Mex., and Alta. (*Atenia gairdneri* Hook. & Arn.)—Stems slender, 30 to 60 cm. high, usually simple; leaflets 4 to 12 cm. long; flowers white; fruit glabrous.

The Blackfoot Indians used the plant as a remedy for sore throat, and applied it to swellings to reduce the inflammation. They also ate the roots raw, cooked them as a vegetable, and used them for flavoring stews.

2. Carum carui L. CARAWAY. Abundant at the edge of cultivated ground near foot of Sherburne Lake. Native of Eur.; often cultivated and escaping.—Stems 30 to 60 cm. high, branched; lobes of the leaves 5 to 20 mm. long; flowers white or pink; fruit glabrous.

7. SIUM L.

1. Sium cicutaefolium Gmel. WATER PARSNIP. Swamps at low altitudes on the west slope. B. C. to Calif., Va., and Newf.—Glabrous perennial, 0.5 to 1 meter high; leaves pinnate, the 7 to 15 leaflets 3 to 8 cm. long, linear or lanceolate, sharply toothed, the leaves of plants growing in water sometimes 2 or 3 times lobed; flowers white, in broad umbels; bracts and bractlets narrow; fruit 3 mm. long, somewhat flattened from the sides, with conspicuous ribs.

8. CICUTA L.

Glabrous perennials with leafy stems; leaves once or twice pinnate, the leaflets toothed; flowers white; bracts few or none; bractlets narrow; fruit of 2 rounded carpels, with conspicuous ribs.

Leaves without bulblets; leaflets lanceolate . . . . . **1. C. occidentalis.**

Leaves, especially the upper ones, with small bulbs in the axils; leaflets linear. **2. C. bulbifera.**

1. Cicuta occidentalis Greene. WATER HEMLOCK. Occasional on the west slope at low altitudes, in swampy thickets. Calif. to Alta., S. Dak., and N. Mex.—Plants about 1 meter high, stout; leaves twice pinnate; leaflets 5 to 10 cm. long, sharply toothed; fruit 3 mm. long.

The roots are poisonous to stock and to human beings.

2. Cicuta bulbifera L. Sphagnum bogs on the west slope. B. C. to Oreg., Md., and Me.—Plants slender, 30 to 50 cm. high, often tinged with purple; leaves 2 or 3 times divided, the leaflets 2 to 5 cm. long; fruit 2 mm. long.

9. HERACLEUM L.

1. Heracleum lanatum Michx. COW PARSNIP. PLATE 51, B. Common at nearly all altitudes, usually in moist woods or thickets, often in wet meadows, and sometimes even on high rock slides. Alaska to Calif., N. Mex., N. C., and Vt.—Coarse perennial, 1 to 1.5 meters high, very hairy; leaves large, the few leaflets 10 to 30 cm. broad, toothed and lobed, the petioles with dilated sheaths; flowers white, in broad umbels, the bracts and bractlets linear; fruit flat, about 1 cm. long, winged on the edges, finely hairy.

In the park the curious name of "sacred rhubarb" is sometimes applied to this plant, especially by the guides. The same name is found also in ethnological literature, and it is derived from the fact that this is a sacred plant of the Blackfoot Indians and is used in some of their ceremonials, as in the sun dance, in which stalks are placed upon the altar. The plant certainly bears little resemblance to rhubarb. In the spring the Blackfoot Indians eat the succulent young shoots of the cow parsnip after roasting them over hot coals. The plant is an important article of food of many of the northwestern Indians.

10. PASTINACA L.

1. Pastinaca sativa L. PARSNIP. Occasional on the east slope at low altitudes, in thickets or cultivated ground. Native of Eur.; cultivated and often naturalized.—Biennial, glabrous or nearly so; leaves pinnate, the leaflets ovate, sessile, 2 to 10 cm. long, lobed and toothed; flowers yellow; involucre none; fruit flat, glabrous, 5 to 7 mm. long, winged along the edges.

11. COGSWELLIA Spreng.

Perennials with thick roots; leaves divided into numerous small or large leaflets; bracts none, but bractlets usually present; fruit strongly flattened, the carpels winged on the edges.

Leaflets 5 to 10 cm. long, linear, entire . . . . . **1. C. triternata.**
Leaflets less than 1 cm. long, toothed or lobed.
  Fruit glabrous, about 1 cm. long; flowers white . . . . . **2. C. macrocarpa.**
  Fruit puberulent, 4 to 5 mm. long; flowers yellow . . . . . **3. C. sandbergii.**

1. Cogswellia triternata (Pursh) Jones. Frequent on the east slope, at low (rarely at middle) altitudes, on dry open hillsides or in aspen thickets. B. C. to Calif., Wyo., and Alta.—Stems 30 to 60 cm. high, minutely puberulent; leaves 2 or 3 times divided, pale green; flowers yellow; fruit glabrous, 6 to 12 mm. long, 3 to 4 mm. wide.

2. Cogswellia macrocarpa (Nutt.) Jones. East entrance, on dry open hillsides. B. C. to Calif., Colo., and Sask.—Stems 20 to 50 cm. high, purplish, finely puberulent, branched from the base; leaves divided into numerous small puberulent leaflets; fruit 5 to 7 mm. wide.

3. Cogswellia sandbergii (Coult. & Rose) Jones. Occasional above or shortly below timber line, on open slopes or in meadows. B. C., Idaho, Mont., and Alta.—Stems 10 to 15 cm. high, purplish, minutely puberulent; leaves small, soon withering, divided into very small, nearly glabrous leaflets; fruit about 3 mm. wide.

12. ANGELICA L. Angelica.

Tall perennials, glabrous or nearly so; leaves with 3 pinnate divisions, the leaflets large, toothed or lobed; flowers in large umbels; fruit flattened, glabrous, the lateral ribs winged.

Flowers pale greenish yellow; umbel with several large toothed leaflike bracts at the base . . . . . 1. **A. dawsoni.**
Flowers white; umbel without bracts or with 1 or 2 inconspicuous ones . 2. **A. lyallii.**

1. Angelica dawsoni S. Wats. Yellow angelica. Frequent about timber line, in meadows or moist woods, sometimes in moist places at middle altitudes. B. C., Idaho, Mont., and Alta.—Stems 0.3 to 1 meter high, rather slender; leaflets lance-oblong, thin, bright green, 2 to 6 cm. long, sharply toothed; umbels long-stalked; fruit 5 mm. long.

A rather showy plant when in flower.

2. Angelica lyallii S. Wats. White angelica. Common at low and occasionally at middle altitudes, in moist woods or thickets or along streams. B. C. to Oreg., Wyo., and Alta.—Stems very stout, 0.5 to 1.5 meters high; petioles with very broad sheathing bases; leaflets thick, ovate, coarsely toothed, 2 to 7 cm. long; fruit 4 to 6 mm. long.

A very showy plant, which blooms for a long time. In general appearance it is much like *Heracleum lanatum*. The roots have a strong odor.

13. LEPTOTAENIA Nutt.

1. Leptotaenia multifida Nutt. Frequent on the east slope at low and middle altitudes and sometimes near timber line, on open rocky slopes or in thickets. B. C. to Calif., Colo., and Alta.—Stout perennial, 30 to 80 cm. high, with glabrous stems; leaves finely puberulent, 10 to 30 cm. wide, divided into numerous leaflets, these with deep linear lobes; flowers yellow; fruit flat, 8 to 12 mm. long, the carpels with a narrow corky wing around the edge.

The plants bloom early in the season, and the leaves soon turn yellow. McClintock gives the following uses of this plant among the Blackfoot Indians: The root was used to prepare a hot drink, taken as a tonic by people in poor health, especially to enable them to put on flesh; the pulverized roots were burned as incense; when horses had the distemper they were made to inhale smoke from the burning plant; the pulverized plant was mixed with brains and employed in tanning.

62. CORNACEAE. Dogwood Family.

1. CORNUS L.

Plants shrubby; flowers in open cymes, not surrounded by an involucre.
1. **C. stolonifera.**
Plants herbaceous; flowers in a dense head surrounded by an involucre of 4 white petal-like bracts . . . . . 2. **C. canadensis.**

1. Cornus stolonifera Michx. Red-osier dogwood. Common at low and middle altitudes, in woods or swamps or on moist open slopes. Widely distributed in N. Amer. (*Svida instolonea* A. Nels.)—Shrub, 1 to 2 meters high; branches reddish or purplish or sometimes green; leaves oval or ovate, opposite, entire, acute, with fine appressed hairs on the lower surface; flowers small, white, in flat cymes; fruit white or tinged with blue, juicy, not edible.

Very abundant in some places; forming extensive thickets along the Flathead at Belton. The leaves turn red in autumn.

2. Cornus canadensis L. Bunchberry. Common at low altitudes on the west slope, in deep or thin woods, on brushy slopes, etc.; rare on the east slope, but found in swampy woods just below Lake McDermott, and probably elsewhere. Alaska to

Calif., Colo., N. J., and Lab. (*Chamaepericlimenum canadense* Aschers. & Graebn.)—Stem 5 to 20 cm. high, unbranched, bearing a whorl of 4 to 6 leaves at the top; leaves ovate or obovate, 3 to 6 cm. long, acute, entire; flowers in a single cluster, small, greenish, the bracts large and conspicuous; fruit a dense head of small, bright red drupes.

A very handsome plant in either flower or fruit. The flower head is likely to be taken for a single flower, but close examination of the center of the "flower" will show that it is composed of numberous small flowers. The flowering dogwood (*Cornus canadensis* L.) of the eastern States is a closely related tree.

63. PYROLACEAE. Pyrola Family.

Perennial herbs with rootstocks; leaves mostly basal, evergreen, entire or toothed; flowers in racemes or corymbs; sepals 5 or 4; petals 5 or 4, waxy; stamens twice as many as the petals; fruit a capsule, containing numerous minute seeds.

Flower one on each stem . . . . . **2. MONESES.**
Flowers few or numerous.
  Flowers mostly in corymbs; leaves oblanceolate, scattered along the stem; filaments hairy. . . . . **1. CHIMAPHILA.**
  Flowers in racemes; leaves broadly ovate to rounded or kidney-shaped, crowded at or near the base of the stem; filaments glabrous . . . . . **3. PYROLA.**

1. CHIMAPHILA Pursh.

1. Chimaphila umbellata occidentalis (Rydb.) Blake. PIPSISSEWA. Frequent at low and middle altitudes, in deep woods. Alaska to Calif., N. Mex., and Mont. (*C. occidentalis* Rydb.)—Plants loosely branched, 10 to 30 cm. high, glabrous, almost shrubby; leaves nearly sessile, mostly whorled, 4 to 6 cm. long, obtuse or acute, dark green, very thick and leathery, sharply toothed; petals waxy, purplish or pink, 5 to 7 mm. long.

The dried leaves were smoked by the Blackfoot Indians like tobacco. The flowers are attractive, but they are open only a short time. The leaves persist through the winter.

2. MONESES Salisb.

1. Moneses uniflora (L.) A. Gray. WOOD-NYMPH. Occasional at middle altitudes in deep woods on mossy banks. Alaska to Oreg., N. Mex., Pa., and Greenl.; also in Eur. and Asia.—Stems simple, 5 to 12 cm. high; leaves mostly crowded at the base of the stem, opposite or in whorls of 3, short-petioled, rounded, 8 to 15 mm. long, finely toothed; flower nodding, saucer-shaped; petals 8 to 10 mm. long, waxy white; anthers yellow.

A very beautiful little plant, of infrequent occurrence but often forming colonies a meter broad.

3. PYROLA L. PYROLA.

Plants perennial, herbaceous, the leaves mostly basal, evergreen; flowers nodding; fruit a 5-lobed capsule.—The name wintergreen is sometimes applied to these plants, but it is inappropriate, since the plants are not closely related to the true wintergreen.

Style very short, almost wanting . . . . . **1. P. minor.**
Style long (2 to 5 mm.).
  Leaves blotched with white on the upper surface . . . . . **2. P. picta.**
  Leaves not blotched.
    Flowers pink or purplish; leaves mostly 3.5 to 6 cm. long.
      Leaves minutely toothed by the protruding ends of the veins, often pointed. **3. P. bracteata.**
      Leaves merely with low rounded teeth or entire, the ends of the veins not protruding, the leaves rounded at the apex . . . . . **4. P. asarifolia.**

Flowers white or greenish white; leaves mostly 1.5 to 3 cm. long.
Leaves rounded, dark green; petals about 7 mm. long; racemes not 1-sided. **5. P. chlorantha.**
Leaves oval or ovate, usually acutish, rather pale green; petals about 4 mm. long; racemes 1-sided . . . . . **6. P. secunda.**

1. Pyrola minor L. SMALL PYROLA. Rare; at low, middle, or high altitudes, in swampy woods or on moist banks. Alaska to Calif., Colo., Conn., and Greenl.; also in Eur. and Asia. (*Erxlebena minor* Rydb.)—Leaves rounded, 1 to 3 cm. long, petioled, crenulate; petals 4 to 5 mm. long, white or pink.

2. Pyrola picta Smith. SPOTTED PYROLA. Deep moist woods near Sun Camp. B. C. to Calif., Colo., and Mont.—Leaves oval or broadly ovate, often acutish, 2 to 6 cm. long, pale beneath; petals 6 mm. long, greenish or purplish.

3. Pyrola bracteata Hook. Wet woods below Lake McDermott; occasional on the west slope at low and middle altitudes, in deep woods. Alaska to Oreg. and Mont.—Leaves broadly ovate or rounded, 3 to 8 cm. long, dark green, shining; petals 7 to 9 mm. long.

Perhaps only a form of *P. asarifolia*.

4. Pyrola asarifolia Michx. PINK PYROLA. Common at low or rarely at middle altitudes, in bogs or moist woods or thickets. B. C. to Calif., N. Mex., Minn., N. Y., and N. S. (*P. uliginosa* Torr.)—Leaves 3 to 8 cm. long, rounded, often broader than long, green or dark green, usually shining, long-petioled; petals 5 to 7 mm. long, pale or deep pink.

This is very abundant in some localities. The flowers last only a short time.

5. Pyrola chlorantha Swartz. Occasional at almost all altitudes, in deep woods, or under bushes about timber line. B. C. to Calif., Md., and Lab.; also in Eur.—Leaves long-petioled, dull, 1 to 4 cm. wide.

6. Pyrola secunda L. Common at nearly all altitudes, in moist woods or thickets, often on banks or under bushes above timber line. Alaska to Calif., Va., and Lab.; also in Eur. and Asia. (*Ramischia secunda* Garcke.)—Plants 10 to 20 cm. high, often forming dense colonies; leaves 2 to 4 cm. long, finely toothed; flowers usually numerous.

64. MONOTROPACEAE. Indian-pipe Family.

The plants of this family are saprophytes (plants which live on decayed vegetable or animal matter), or parasites upon the roots of other plants; they have no green coloring matter (chlorophyll). The leaves are reduced to scales; the petals are distinct or united at the base; the fruit is a capsule.

Plants glabrous; flower one on each stem . . . . . **1. MONOTROPA.**
Plants hairy; flowers several or many.
Corolla of united petals; plants 20 to 100 cm. high, with hard stems; flowers numerous . . . . . **2. PTEROSPORA.**
Corolla of distinct petals; plants mostly 10 to 20 cm. high, with succulent stems; flowers few. . . . . **3. HYPOPITYS.**

1. MONOTROPA L.

1. Monotropa uniflora L. INDIAN-PIPE. Occasional at low altitudes on the west slope, in deep moist woods; probably also on the east slope. Widely distributed in N. Amer. and in Asia.—Plants 10 to 30 cm. high, usually growing in small clumps, white or pink; flower drooping, 1.5 to 2 cm. long.

A curious plant of striking appearance; sometimes known as ghost-plant or corpse-plant. The simple stem with the recurved flower suggests a pipe, hence the common name. The plants turn black after flowering. Although the flower is curved downward, the seed pod is held erect.

2. PTEROSPORA Nutt.

1. Pterospora andromedea Nutt. PINEDROPS. Woods at Sun Camp, and doubtless elsewhere. B. C. to Calif., Mex., Pa., and Que.—Plant unbranched, brownish or purplish, very sticky; flowers whitish, the corolla 6 to 8 mm. long.

Very common in many parts of the West, growing in pine woods.

3. HYPOPITYS Adans.

1. Hypopitys latisquama Rydb. PINESAP. Woods about the east entrance, and probably elsewhere. B. C. to Mont. and N. Mex.—Plant pink, finely hairy above; flowers about 1.5 cm. long.

Related species are widely distributed in North America.

65. ERICACEAE. Heath Family.

Shrubs (sometimes very small) with alternate or opposite leaves; corolla of united or distinct petals; fruit a capsule or drupe.

Leaves opposite; corolla saucer-shaped . . . . . **1. KALMIA.**
Leaves alternate; corolla not saucer-shaped.
  Leaves linear . . . . . **2. PHYLLODOCE.**
  Leaves much broader than linear.
  Plants erect shrubs, 0.3 to 2 meters high; fruit a dry capsule.
    Leaves evergreen; corolla of distinct petals . . . . . **3. LEDUM.**
    Leaves deciduous; corolla of united petals, urn-shaped . . **4. MENZIESIA.**
  Plants prostrate or creeping shrubs; fruit a drupe, or a capsule surrounded by a fleshy calyx.
    Leaves rounded; fruit a capsule, surrounded by the fleshy calyx. **5. GAULTHERIA.**
    Leaves wedge-shaped or obovate; fruit a drupe . . **6. ARCTOSTAPHYLOS.**

1. KALMIA L.

1. Kalmia microphylla (Hook.) Heller. ROCKY MOUNTAIN LAUREL. Common in alpine meadows; also in sphagnum bog at Johns Lake. Alaska to Calif., Colo., and Alta.—Erect glabrous shrub, 10 to 40 cm. high; leaves evergreen, leathery, oval or oblong, 1 to 2.5 cm. long, green on the upper surface, pale beneath; flowers bluish purple, 10 to 15 mm. broad.

A very beautiful plant when in full flower, but the flowers last only a short time. At Johns Lake the plants are abundant, and they are much larger than those found at high altitudes. The stamens of this plant are of interest; there are 10 of them; at first the anthers are held in little pockets of the outspread corolla, but if the corolla is struck gently the anthers are released and the stamens stand erect. The mountain laurel of the East (*Kalmia latifolia* L.) is a related plant.

2. PHYLLODOCE Salisb.

Small erect shrubs, 10 to 30 cm. high, with densely leafy stems; flowers slender-stalked, clustered at the ends of the branches; stamens 10; fruit a small capsule.

Corolla deep rose, bell-shaped, open; sepals obtuse . . . . . **1. P. empetriformis.**
Corolla yellowish white, urn-shaped, contracted at the mouth; sepals acute. **2. P. glandulifiora.**

1. Phyllodoce empetriformis (Smith) Don. RED HEATHER. Frequent and often abundant in meadows above timber line. Alaska to Calif., Colo., and Alta. (*Bryanthus empetriformis* A. Gray.)—Leaves evergreen, 5 to 12 mm. long, sessile, grooved on both sides; corolla 6 to 8 mm. long.

The daintiness and beautiful color of the flowers make this one of the finest plants of the park. Great patches are a conspicuous feature of alpine meadows, and the flowers last for some time. In some meadows the red heather is more abundant, and in others the white heather. The seed capsules are deep red, and they are covered with beautiful golden resin dots. The European heathers (species of *Erica*) are similar in appearance to this plant, and they belong to the same family, but none of the true heathers are natives of North America.

2. Phyllodoce glanduliflora (Hook.) Coville. WHITE HEATHER. Common in meadows above timber line. Alaska to Wash., Wyo., and Alta. (*Bryanthus glanduliflorus* A. Gray.)—Leaves 4 to 8 mm. long; corolla about 8 mm. long; flower stalks sticky with fine gland-tipped hairs.

This is a far less handsome plant than the red heather, and the flowers are much less conspicuous. It is abundant at Sexton Glacier and elsewhere, but at Iceberg Lake and in some other similar localities it is rare or absent.

3. LEDUM L.

1. Ledum glandulosum Nutt. LABRADOR TEA. Common in woods about Belton. B. C. to Calif., Utah, and Alta.—Shrub, 0.3 to 1 meter high, nearly glabrous; leaves elliptic or oval, 1.5 to 3 cm. long, green on the upper side, paler and resinous beneath; flowers white, in clusters at the ends of the stems, slender-stalked; petals 5, 5 to 7 mm. long; fruit a 5-celled capsule, 4 to 5 mm. long.

4. MENZIESIA Smith.

1. Menziesia glabella A. Gray. MENZIESIA. Common in all the wooded portions of the park; usually in woods; a characteristic shrub of timber line, among stunted pines and firs. B. C. to Oreg., Wyo., and Alta.—Slender shrub, 0.6 to 2 meters high, often forming thickets; leaves thin, pale green, elliptic or obovate, 3 to 6 cm. long, entire, nearly glabrous; flowers in clusters at the ends of the old branches; corolla about 8 mm. long, urn-shaped, greenish yellow, tinged with bronze; capsule 4-celled.

The flowers are inconspicuous.

5. GAULTHERIA L.

1. Gaultheria humifusa (Graham) Rydb. CREEPING WINTERGREEN. Occasional in meadows above timber line; Iceberg Lake; Granite Park; Sexton Glacier. B. C. to Calif., Colo., and Alta.—Plants small, the slender stems creeping over the ground and forming small mats; leaves 1 to 2 cm. long, finely toothed or entire, dark green; corolla bell-shaped, white, 3 mm. long; fruit small, red.

The wintergreen or checkerberry (*Gaultheria procumbens* L.), from which wintergreen oil is obtained, is a closely related but larger plant of the Eastern States.

6. ARCTOSTAPHYLOS Adans.

1. Arctostaphylos uva-ursi (L.) Spreng. BEARBERRY. Abundant at low and middle altitudes, in woods or on open slopes. Alaska to Calif., N. Mex., N. J., and Lab.—Prostrate glabrous shrub; leaves obovate, very thick, 1 to 3 cm. long, nearly sessile, evergreen, entire; flowers white or pink, in small clusters; fruit bright red, 6 to 10 mm. in diameter.

Known also as kinnikinnick. On steep open slopes the plants form great slippery carpets over which it is difficult to climb. The fruit is very handsome; it ripens in late summer. The plants of the west slope seem to bear more abundant and larger fruit than those found on the east side of the park. The branches are used in the West for Christmas greens, and they make excellent camp beds. The fruit is mealy and flavorless. It was gathered for food by the Blackfoot Indians, and was eaten raw, or mashed in fat and fried. The dried leaves were smoked like tobacco.

66. VACCINIACEAE. Blueberry Family.

1. VACCINIUM L.

Slender shrubs; leaves alternate, deciduous, finely toothed or entire; flowers solitary in the leaf axils or in racemes; calyx lobes 4 or 5; corolla urn-shaped or bell-shaped, with 5 or 4 short lobes; stamens 10 or 8, the anthers usually with 2 awns on the back; fruit juicy, with small seeds.—The name huckleberry is often applied to plants of this genus (generally in the Rocky Mountains), but that name is better reserved for species of the genus *Gaylussacia*, none of which are found in the West.

Leaves very hairy, especially beneath; flowers in short racemes; anthers without awns; leaves entire . . . . . **1. V. canadense.**
Leaves glabrous; flowers solitary in the leaf axils; anthers with 2 awns on the back; leaves finely toothed.
  Leaves obovate or oblanceolate, obtuse; young branches reddish or brownish, not angled . . . . . **2. V. caespitosum.**
  Leaves lanceolate to ovate, rarely obovate but then acute; young branches green, angled.
    Leaves mostly 3 to 6 cm. long; plants usually 0.6 to 1 meter high. **3. V. membranaceum.**
    Leaves 2.5 cm. long or usually much shorter; plants 15 to 40 cm. high.
      Fruit blue or bluish black; leaves broadly ovate or rounded-ovate; plants loosely branched . . . . . **4. V. myrtillus.**
      Fruit wine-red; leaves lanceolate or lance-ovate; plants with dense erect branches . . . . . **5. V. scoparium.**

1. Vaccinium canadense Richards. CANADA BLUEBERRY. Rather common in dense flat-woods about Belton. Mont. to Ill., N. J., and Newf. (*Cyanococcus canadensis* Rydb.)—Slender shrub, 30 to 60 cm. high; leaves lanceolate or ovate, 2 to 4 cm. long, acute; corolla white or pinkish, 4 mm. long; fruit about 5 mm. in diameter, black, with a dense pale bloom.

This is apparently the most western station known for the species. The fruit is sweet and rather insipid.

2. Vaccinium caespitosum Michx. Common at low altitudes, rarely found at middle elevations, mostly on dry open slopes or even on prairie or in thin woods, occasionally in deep moist woods. B. C. to Colo., N. H., and Lab.—Densely branched shrub, 10 to 40 cm. high; leaves 2 to 5 cm. long, finely toothed, wedge-shaped at the base; corolla white or pink, 4 to 5 mm. long; fruit at first wine-red, becoming dark blue, with a pale bloom.

The fruit is sweet and insipid; it is too small and not sufficiently abundant to be edible. In 1919 very few of the plants bore fruit. The plants often form dense carpets on open slopes, and they are conspicuous in late summer when the leaves turn red or purplish. Rydberg states that the plant is alpine or subalpine, and while this is true in some regions, it is far from being the case in Glacier Park. Here the plant grows in the Transition and in the lower part of the Canadian Zone.

3. Vaccinium membranaceum Dougl. TALL WHORTLEBERRY. Common and often abundant at middle altitudes and about timber line, in thin or dense woods, sometimes on open slopes. B. C. to Calif., Wyo., and Mich. (*V. globulare* Rydb.)—Much-branched shrub, usually about 60 cm. high; leaves thin, nearly sessile, finely toothed, acute or obtuse; flowers slender-stalked; corolla 5 to 6 mm. long, white or pale pink. fruit commonly 8 to 10 mm. in diameter.

This is the only whortleberry of the region whose fruit is of importance; in many places the plants are abundant and the fruit can be gathered in quantity. The fruit is of excellent quality; indeed it is doubtful if it is surpassed by that of any other species. It is rather tart and very juicy and the seeds are so small as to be negligible.

It makes excellent pies and is still better when eaten fresh with sugar and cream. The fruit varies greatly in size, shape, and color; in moist woods it is larger, juicier, and more tart, while in exposed places it is small, dryer, and sweeter. Usually it is hemispheric, but frequently it is pear-shaped. Commonly the fruit is purplish black, and often it has a bloom, especially in open places. Some plants bear wine-red fruit which seems to be quite ripe. In autumn the leaves turn deep red.

4. Vaccinium myrtillus L. LOW WHORTLEBERRY. Frequent at middle altitudes, and also about Belton; usually in deep woods, but occasionally in rather open places. B. C. to N. Mex. and Alta.; also in Eur. (*V. oreophilum* Rydb.)—Usually about 30 cm. high; leaves mostly 1.5 to 2 cm. long, finely toothed, obtuse or acutish; corolla about 4 mm. long; fruit 5 to 8 mm. in diameter.

The fruit is rather tart and of good flavor, but the plants are so small that it is not easily gathered. The branching in this species is loose and open, and quite unlike the dense broomlike habit of *V. scoparium*.

5. Vaccinium scoparium Leiberg. RED WHORTLEBERRY. Usually about timber line, but sometimes at middle altitudes, on open slopes or in thin or dense woods. B. C. to Calif., N. Mex., and Alta.—Plants usually 20 to 30 cm. high, with dense, mostly erect, broomlike branches; leaves acute, usually 1 to 1.5 cm. long, finely toothed, pale green; corolla 3 mm. long, pink; fruit 4 to 5 mm. in diameter.

The fruit is of good flavor, but it is too small to be edible.

67. PRIMULACEAE. Primrose Family.

Annual or perennial herbs; leaves basal, entire or toothed; sepals 4 or 5, partially united; corolla 4 or 5-lobed; stamens as many as the calyx lobes and alternate with them; fruit a 1-celled capsule.

Corolla small (3 to 4 mm. long), white, the lobes erect or spreading; stamens distinct, included . . . . . **1. ANDROSACE.**
Corolla large (about 10 mm. long), rose-purple, the lobes reflexed; stamens united by their anthers, standing above the corolla . . . . . **2. DODECATHEON.**

1. ANDROSACE L.

Small annuals; leaves in a basal rosette, entire or toothed; flowers slender-stalked, in umbels.

Stems glabrous . . . . . **1. A. subumbellata.**
Stems minutely hairy . . . . . **2. A. puberulenta.**

1. Androsace subumbellata (A. Nels.) Small. Occasional above timber line, in meadows or on moist rocky slopes. B. C. to Ariz. and N. Mex.—Plants much branched from the base, 4 to 7 cm. high; leaves oblanceolate, 1 to 2 cm. long, acute; umbels short-stalked or sessile; corolla 3 to 4 mm. long.

2. Androsace puberulenta Rydb. Frequent on the east slope at low altitudes, in low meadows or on dry rocky slopes. Yukon to Ariz. and N. Mex.—Plants 5 to 20 cm. high, with numerous flower stems; leaves oblanceolate, 1 to 3 cm. long; umbels long-stalked; corolla about as long as the calyx.

2. DODECATHEON L.

Perennials; leaves in basal rosettes, entire or nearly so; flowers in long-stalked umbels, nodding; capsule cylindric.

Leaves finely pubescent . . . . . **1. D. cusickii.**
Leaves glabrous . . . . . **2. D. pauciflorum.**

1. Dodecatheon cusickii Greene. East entrance, *Mrs. Otto Thompson*. B. C. and Wash. to Mont. and Alta.—Leaves 3 to 7 cm. long, oblong or oblanceolate, obtuse; flowers few, purple, with yellow throat; capsule 8 mm. long.

2. Dodecatheon pauciflorum (Durand) Greene. SHOOTING-STAR. Frequent at nearly all altitudes, but most common above timber line, in moist woods, bogs, or meadows. B. C. and Wash. to Colo. and Sask.—Glabrous perennial, 10 to 40 cm. high; leaves oblanceolate, 3 to 10 cm. long, pale green, entire, obtuse; flowers few or numerous; corolla lobes about 1 cm. long; anthers 4 to 5 mm. long, purple, the filaments yellow; capsule 10 to 15 mm. long.

A handsome plant, often conspicuous in alpine meadows. The flowers last only a short time.

68. GENTIANACEAE. Gentian Family.

1. GENTIANA L. GENTIAN.

Annual or perennial herbs; leaves opposite, entire, sessile; flowers in the leaf axils or clustered at the ends of the stems; calyx 4 or 5-lobed; corolla usually funnel-shaped, 5-lobed; fruit a 1-celled capsule.

Corolla 2 cm. long or shorter.
- Corolla lobes obtuse . . . . . **1. G. glauca.**
- Corolla lobes acute.
  - Corolla with a fringed crown in the throat . . . . . **2. G. acuta.**
  - Corolla without a crown in the throat . . . . . **3. G. propinqua.**

Corolla 2.5 to 4 cm. long.
- Leaves linear, lanceolate, or oblong; corolla 2.5 to 3 cm. long; calyx lobes linear or linear-lanceolate . . . . . **4. G. affinis.**
- Leaves usually very broadly ovate; corolla commonly 3.5 to 4 cm. long; calyx lobes oval to oblong . . . . . **5. G. calycosa.**

1. Gentiana glauca Pall. Reported from Sperry Glacier by Jones. Alaska, B. C., and Mont.; also in Asia. (*Dasystephana glauca* Rydb.)—Perennial, 2 to 10 cm. high, glabrous, with a rosette of basal leaves; stem leaves 2 or 3 pairs, oval or obovate, 1 cm. long; corolla blue, 12 to 18 mm. long.

2. Gentiana acuta Michx. NORTHERN GENTIAN. Occasional at low altitudes, in wet thickets or woods or in bogs, sometimes on slopes above timber line. Alaska to Calif., N. Mex., Me., and Lab.; also in Eur. and Asia. (*Amarella scopulorum* Greene.)—Annual; stems slender, glabrous, 15 to 30 cm. high, simple, leafy; leaves oblong or lanceolate, 1 to 3 cm. long, acute or obtuse; corolla pale blue or lavender.

3. Gentiana propinqua Richards. Piegan Pass, on open rocky slope. Alaska, B. C., Mont., and Alta.; also in Asia. (*Amarella propinqua* Greene.)—Annual, 3 to 15 cm. high, glabrous, commonly 1-flowered; stem leaves lanceolate or ovate, 5 to 12 mm. long; corolla pale blue, 1 to 1.5 cm. long.

4. Gentiana affinis Griseb. PRAIRIE GENTIAN. Low places on prairie at east entrance. B. C. to Colo. and Sask. (*Dasystephana affinis* Rydb.)—Plants usually tufted, 10 to 30 cm. high, glabrous; leaves 2 to 4 cm. long, acute or obtuse; corolla blue, with a narrow tube.

5. Gentiana calycosa Griseb. BLUE GENTIAN. Common in meadows above timber line; occasionally found in moist places at middle altitudes. Wash. to Calif., Wyo., and Mont. (*Dasystephana calycosa* Rydb.; *D. obtusiloba* Rydb.)—Stems 10 to 30 cm. high, glabrous, often in small clumps; leaves 1 to 3 cm. long, obtuse or acutish at the apex; flowers 1 or few, deep blue.

One of the finest flowers of the park, frequently very abundant in alpine meadows. The flowers last a long time, and the first ones appear in early summer. Dwarfed plants sometimes have corollas only 3 cm. long or even shorter. All our material belongs to *Dasystephana obtusiloba* Rydb., the type of which came from the Sperry Glacier region, but there seem to be no important differences between this form and *Gentiana calycosa*.

69. MENYANTHACEAE. Buckbean Family.

1. MENYANTHES L.

1. Menyanthes trifoliata L. BUCKBEAN. Frequent in sphagnum bogs on the west slope. Alaska to Calif., Colo., Pa., and Lab.—Glabrous perennial with thick rootstocks; leaves basal, long-petioled, with 3 leaflets, these oval or elliptic, 5 to 10 cm. long, entire, fleshy; flower stalk 10 to 30 cm. high, the flowers in racemes; corolla white or pinkish, 1.5 cm. long, 5-lobed, bearded within; fruit a capsule.

The thick fleshy rootstocks sometimes lie upon the surface of the sphagnum.

70. APOCYNACEAE. Dogbane Family.

1. APOCYNUM L. DOGBANE.

Perennial herbs with milky juice and forking stems; leaves opposite, entire, short-petioled; flowers in cymes; sepals 5; corolla bell-shaped, 5-lobed; stamens 5; fruit of 2 long slender pods.—The leaves turn yellow in autumn. The plants are sometimes known as Indian hemp. Their stems contain a tough fiber, from which the Indians made rope, twine, etc. The Blackfoot Indians used a decoction of the root as a laxative; they employed the decoction also as a wash for the hair, to prevent its falling.

Corolla less than twice as long as the calyx, greenish white, the lobes erect. **1. A. cannabinum.**

Corolla more than twice as long as the calyx, white striped with pink, the lobes spreading.

Leaves glabrous . . . . . **2. A. ambigens.**

Leaves more or less hairy beneath . . . . . **3. A. pumilum.**

1. Apocynum cannabinum L. COMMON DOGBANE. Rocky river banks at Belton, forming large patches. Widely distributed in N. Amer.—Stems purplish, 0.5 to 1 meter high, glabrous; leaves oblong or lance-oblong, 5 to 10 cm. long, glabrous; corolla 3 to 5 mm. long.

2. Apocynum ambigens Greene. PINK DOGBANE. Frequent at low and middle altitudes, on dry open slopes; often on talus slopes. Wash. to N. Mex. and S. Dak.—Plants 20 to 60 cm. high, with pale stems, often much branched; leaves ovate to rounded, 2 to 6 cm. long, green above, pale beneath, acute to rounded at the apex; corolla 5 mm. long, pale pink, with dark pink stripes inside, sweet-scented.

A handsome plant, often loaded with the delicately colored bell-shaped flowers.

3. Apocynum pumilum (A. Gray) Greene. Occasional at low altitudes, on open slopes or in thin woods. Wash. to Calif., Utah, and Mont.—Similar to *A. ambigens*, differing only in the pubescent leaves; pods 8 to 14 cm. long.

This is doubtfully distinct from *A. ambigens*, and it is probable that both are merely forms of *A. androsaemifolium* L.

71. ASCLEPIADACEAE. Milkweed Family.

1. ASCLEPIAS L.

1. Asclepias speciosa Torr. MILKWEED. Prairie and open hillsides about the east entrance. B. C. to Calif., Kans., and Minn.—Coarse perennial, 0.5 to 1 meter high, somewhat woolly, with milky juice; leaves large, oval, sessile, opposite, entire; flowers purplish pink, 1 to 1.5 cm. long, showy, in umbels; fruit a large pod, 7 to 10 cm. long, the numerous seeds each tipped with a tuft of long silky white hairs.

The young sprouts of some of the closely similar species of milkweed in the Eastern States are cooked like asparagus. There is a popular belief that the milky juice will destroy warts.

72. CONVOLVULACEAE. Morning-glory Family.

1. CONVOLVULUS L.

1. Convolvulus arvensis L. BINDWEED. Reported from Belton by Jones. Native of Eur.; naturalized as a weed in N. Amer.—Slender prostrate perennial, glabrous or nearly so; leaves oblong, 1 to 5 cm. long, obtuse, entire, but with a lobe on each side at the base; flowers solitary in the leaf axils; corolla 1.5 to 2 cm. long, funnel-shaped, white or pink; fruit a capsule.

73. POLEMONIACEAE. Phlox Family.

Annual or perennial herbs; leaves opposite or alternate, entire, lobed, or pinnate; sepals 5, partly united; corolla 5-lobed; stamens 5, attached to the corolla tube; fruit a 3-celled capsule.

Leaves pinnate or deeply lobed.
  Leaves pinnate, with rounded leaflets; plants perennial; flowers blue.
    1. POLEMONIUM.
  Leaves divided into linear or threadlike lobes; plants annual; flowers white.
    Flowers sessile; lobes of leaves stiff, with spiny tips . . . **2. NAVARRETIA.**
    Flowers slender-stalked; lobes of leaves thin, not spiny-tipped.
      6. LINANTHUS.
Leaves entire.
  Plants perennial, forming dense mats or tufts; corolla white, 1 to 1.5 cm. broad.
    3. PHLOX.
  Plants annual, not tufted; corolla pink or purplish, much less than 1 cm. broad.
    Leaves alternate . . . . . **4. COLLOMIA.**
    Leaves, except the uppermost, opposite . . . . . **5. MICROSTERIS.**

1. POLEMONIUM L.

Perennials, more or less hairy; flowers in loose or dense clusters, blue.

Leaflets opposite, not sticky; corolla 7 to 9 mm. long . . . . . **1. P. parvifolium.**
Leaflets whorled, very sticky; corolla 15 to 20 mm. long. . . . . **2. P. viscosum.**

1. Polemonium parvifolium Nutt. JACOB'S-LADDER. Common at nearly all altitudes, at least on the east slope, in woods, thickets, or meadows, or on open slopes. Alta. to Wyo.—Plants 10 to 30 cm. high, usually in dense clumps; leaflets 11 to 25 or more, 2 to 10 mm. long.

2. Polemonium viscosum Nutt. SKUNK-PLANT. Common on rock slides above timber line; sometimes found on moist rocky slopes near snow banks at middle altitudes. Alta. to Wyo. and Utah.—Plants 5 to 10 cm. high, forming dense clumps, extremely viscid; leaflets numerous, 1 to 4 mm. long; flowers in a dense sticky cluster.

The plant has a heavy odor, which strongly suggests a skunk; because of its stickiness it is unpleasant to handle. The withered corollas often persist for some time.

2. NAVARRETIA Ruiz & Pav.

1. Navarretia minima Nutt. PINCUSHION PLANT. About dried-up pools on prairie at east entrance. Wash. to Calif., Ariz., and Nebr.—Plants annual, 1 to 4 cm. high, each one forming dense rounded mass; leaves divided into numerous slender stiff sharp-pointed lobes; flowers crowded at the ends of the stems; corolla white, 7 mm. long.

An inconspicuous little plant. Upon trying to pull up the plants, one finds the leaf lobes as prickly as pin points.

3. **PHLOX** L. Phlox.

Low matted perennials; leaves narrow, entire; flowers white or bluish, with a slender tube, mostly solitary and sessile at the ends of the branches.—The various kinds of cultivated phlox belong to this genus.

Leaves awl-shaped, less than 2 mm. wide, with cobwebby hairs; corolla 8 to 10 mm. long . . . . . **1. P. hoodii.**
Leaves linear or oblong, 2 to 4 mm. wide, without cobwebby hairs except sometimes at the base; corolla 15 to 18 mm. long . . . . . **2. P. alyssifolia.**

1. Phlox hoodii Richards. Dry exposed rocky slopes near the foot of Lake McDermott and on shale slides at east entrance. Yukon to Wyo. and Nebr.—Plants 5 cm. high or less; leaves 4 to 10 mm. long; corolla white, the tube scarcely longer than the calyx.

The plants flower in spring.

2. Phlox alyssifolia Greene. Occasional on the east slope at low altitudes, on dry rocky slopes. Mont. to Utah, Colo., and S. Dak.—Plants 3 to 6 cm. high; leaves 5 to 15 mm. long, acute; corolla bluish white, the tube longer than the calyx.

This, too, blooms in spring, but, as in *P. hoodii*, the shriveled corollas often persist in fruit.

4. **COLLOMIA** Nutt.

1. Collomia linearis Nutt. Occasional at low and middle altitudes, on open slopes, in woods, or on gravel beds along streams. B. C. to Calif., N. Mex., and Minn.—Annual, 10 to 30 cm. high, simple or with few branches, finely hairy; leaves linear-lanceolate, 2 to 5 cm. long, the upper ones broader and often pale at the base; flowers in dense leafy clusters at the ends of the stems; corolla trumpet-shaped, about 1 cm. long, pinkish.

The flowers are inconspicuous and unattractive.

5. **MICROSTERIS** Greene.

1. Microsteris gracilis (Dougl.) Greene. Occasional at low or sometimes at middle altitudes, on dry open slopes. B. C. to Calif., Colo., and Mont. (*Gilia gracilis* Hook.)—Branched annual, 10 to 40 cm. high, with fine gland-tipped hairs, at least above; leaves mostly linear, 2 to 6 cm. long; flowers in the leaf axils; corolla 8 to 12 mm. long, purplish, almost tubular.

6. **LINANTHUS** Benth.

1. Linanthus harknessii (Curran) Greene. East entrance, in fields, *Umbach*. B. C. to Calif., Colo., and Mont. (*Gilia harknessii* Curran.)—Very slender glabrous annual, 5 to 25 cm. high, branched; leaves 3 or 5-lobed to the base, the lobes narrowly linear; corolla white, 3 to 4 mm. long.

74. HYDROPHYLLACEAE. Waterleaf Family.

Annual or perennial herbs; leaves alternate or opposite, without stipules; flowers mostly in 1-sided racemes or cymes, sometimes solitary in the axils; calyx of 5 united sepals; corolla 5-lobed; fruit a 1 or 2-celled capsule.

Plants glabrous; leaves kidney-shaped, 1 to 3 cm. broad, with 5 to 9 short rounded lobes . . . . . **1. ROMANZOFFIA.**
Plants conspicuously hairy; leaves various but never kidney-shaped, pinnately lobed or sometimes entire.
Stamens shorter than the corolla and included in it; plants annual; flowers solitary. **2. NEMOPHILA.**

Stamens exserted from the corolla; plants perennial; flowers in cymes.
Flowers blue or purple . . . . . **4. PHACELIA.**
Flowers white.
Leaves, at least most of them, entire, the lowest ones sometimes pinnate. **4. PHACELIA.**
Leaves deeply lobed. . . . . **3. HYDROPHYLLUM.**

1. ROMANZOFFIA Cham.

1. Romanzoffia sitchensis Bong. MISTMAIDEN. Frequent above timber line, on wet cliffs; occasionally found on wet rocks at lower altitudes. Alaska to Calif. and Mont.—Plants with bulblike bases; leaves basal, slender-petioled, 1 to 3 cm. broad; flower stems slender, 5 to 15 cm. long, often prostrate, few-flowered; corolla white or tinged with pink, 7 to 10 mm. long; capsule longer than the calyx.

A handsome, delicate plant, closely resembling some of the saxifrages.

2. NEMOPHILA Nutt.

1. Nemophila breviflora A. Gray. Collected by Holzinger, somewhere between Lake McDonald and Sperry Glacier. B. C. to Oreg., Colo., and Mont.—Annual, branched, 10 to 30 cm. high; leaves lobed, the lobes oblong-lanceolate, 5 to 15 mm. long, entire; corolla 2 to 3 mm. long, whitish, shorter than the calyx.

3. HYDROPHYLLUM L.

1. Hydrophyllum capitatum Dougl. WATERLEAF. Woods at east entrance *Umbach*. B. C. to Calif., Colo., and Mont.—Stems 10 to 20 cm. high, finely hairy; leaves with 5 or 7 obovate lobes, these 2 to 5 cm. long, lobed; corolla 7 to 8 mm. long.

4. PHACELIA Juss. PHACELIA.

Hairy perennials; flowers in 1-sided racemes or cymes; corolla bell-shaped, the stamens exserted.

Leaves entire; corolla white . . . . . **1. P. leucophylla.**
Leaves lobed; corolla purplish blue.
Leaves lobed about halfway to the midrib, green, nearly glabrous, the lobes broad . . . . . **2. P. lyallii.**
Leaves lobed to the midrib, gray-silky, the lobes linear or oblong . . **3. P. sericea.**

1. Phacelia leucophylla Torr. WHITE PHACELIA. Common at nearly all altitudes, in thin woods or on open slopes, but most abundant above timber line, especially on rock slides. B. C. to Colo. and Nebr.—Stems 10 to 30 cm. high, usually in clumps; leaves oblanceolate or elliptic, 5 to 12 cm. long, acute, with conspicuous veins, covered with stiff grayish hairs; corolla about 6 mm. long, dirty white; calyx covered with stiff bristle-like hairs.

The stiff hairs penetrate the skin easily.

2. Phacelia lyallii (A. Gray) Rydb. BLUE PHACELIA. PLATE 50, B. Common above timber line, especially on rock slides. B. C., Idaho, and Mont.—Plants 10 to 20 cm. high, usually in dense clumps, green; corolla about 5 mm. long.

A very showy plant, which remains in flower a long time; it flowers rather late in the season. One plant found at Sexton Glacier had white flowers.

3. Phacelia sericea (Graham) A. Gray. SILKY PHACELIA. Frequent, at least on the east slope; chiefly at middle altitudes, but sometimes above timber line or at low elevations, on open rocky slopes. B. C. to Nev., Colo., and Alta.—Plants 10 to 30 cm. high, grayish; inflorescence narrow, dense, and spikelike; corolla 5 to 6 mm. long.

This blooms earlier than *P. lyallii*, with which it occasionally grows, and it is only rarely that both are found in flower in the same locality.

75. BORAGINACEAE. Borage Family.

Annual or perennial herbs, the pubescence often of stiff bristle-like hairs; leaves alternate or opposite, entire; flowers regular, in 1-sided racemes or spikes, these variously arranged; calyx of 5 partly united sepals; corolla 5-lobed; stamens 5, attached to the corolla tube; fruit of 4 nutlets, inserted on a receptacle.

Nutlets with hooked prickles, at least on the margins . . . . . **1. LAPPULA.**
Nutlets unarmed, or rarely with straight prickles.
Corolla blue.
Plants glabrous or nearly so; corolla about 1 cm. long . . . . **2. MERTENSIA.**
Plants very hairy; corolla much less than 1 cm. long.
Plants densely tufted, 2 to 8 cm. high, white-hairy; corolla 7 to 9 mm. wide. **3. ERITRICHUM.**
Plants not densely tufted, 10 to 30 cm. high, not white-hairy; corolla 4 to 6 mm. wide . . . . . **4. MYOSOTIS.**
Corolla white or yellow.
Corolla yellow.
Plants covered with stiff sharp bristle-like hairs, biennial, with slender roots, never forming tufts; receptacle conical . . . . . **5. AMSINCKIA.**
Plants with short, mostly appressed hairs, perennial, with thick roots, usually forming dense tufts; receptacle flat . . . . . **6. LITHOSPERMUM.**
Corolla white.
Pedicels in fruit falling off with the closed calyx . . . . **7. CRYPTANTHA.**
Pedicels and calyx not falling in fruit.
Plants perennial, stout, 15 to 30 cm. high; calyx lobes open in fruit; leaves alternate . . . . . **8. OREOCARYA.**
Plants annual, slender, usually less than 15 cm. high; calyx lobes nearly closed in fruit; leaves mostly opposite . . . . . **9. ALLOCARYA.**

1. LAPPULA Moench.

Annuals or perennials; leaves alternate, narrow; flowers blue, in one-sided racemes; corolla with very short tube; nutlets with barbed prickles along the edge and sometimes also on the back.

Racemes with leafy bracts only at the base; plants perennial; corolla 4 to 10 mm. broad.
Corolla 8 to 10 mm. broad; nutlets with a few prickles on the back . . **1. L. diffusa.**
Corolla 4 to 6 mm. broad; nutlets without prickles on the back . . **2. L. floribunda.**
Racemes with small leaflike bracts along the whole length; plants annual; corolla 2 mm. wide or less.
Nutlets with a single row of few prickles along the edge . . . . . **3. L. occidentalis.**
Nutlets with a double row of very numerous prickles along the edge. **4. L. echinata.**

1. Lappula diffusa (Lehm.) Greene. BUR FORGET-ME-NOT. Common at nearly all altitudes, but most abundant near or above timber line, in moist woods or thickets, in meadows, and on open slopes and rock slides. B. C. to Calif., Utah, and Alta.—Plants rough-hairy, 50 to 80 cm. high; lowest leaves oblanceolate, 5 to 20 cm. long, the stem leaves lanceolate or oblong, smaller; fruit 6 to 7 mm. wide, rough on the back and prickly.

A handsome plant with very numerous pale blue flowers which resemble those of the common forget-me-not. It blooms soon after the snow melts, and often forms large dense patches.

2. Lappula floribunda (Lehm.) Greene. Occasional on the east slope at high or low altitudes, on open slopes or in moist woods. B. C. to Calif., N. Mex., and Man.—Similar to *L. diffusa*, except for the smaller flowers.

3. Lappula occidentalis (S. Wats.) Greene. STICKSEED. Occasional on the east slope at low altitudes, on flats or open slopes. Wash. to N. Mex., Mo., and Sask.—Plants simple or branched, hairy, 15 to 60 cm. high; leaves spatulate, oblong, or linear, 1 to 4 cm. long; corolla bright blue; fruit 3 mm. wide.

The barbed prickles of this, as well as of the other species, enable the nutlets to adhere readily to clothing.

4. Lappula echinata Gilib. Dry slope near Many Glacier Hotel; along railroad at Belton, frequent. Native of Eur.; naturalized as a weed in N. Amer.—Stems 30 to 60 cm. high, hairy, branched above; leaves mostly linear and sessile, 1 to 3 cm. long; fruit 3 mm. broad.

This species is not listed from the Rocky Mountains by Rydberg, but it is well established at Belton.

2. MERTENSIA Roth.

1. Mertensia lanceolata (Pursh) DC. BLUEBELLS. East entrance, on dry open slopes. B. C. to Colo. and N. Dak.—Perennial; stems clustered, 15 to 40 cm. high, glabrous; leaves alternate, entire, lanceolate or oblong, 3 to 10 cm. long, glabrous or rough-hairy on the upper surface; flowers in small panicles; corolla blue, funnel-shaped, with a thick tube.

3. ERITRICHUM Schrad.

1. Eritrichum howardi (A. Gray) Rydb. ALPINE FORGET-ME-NOT. Reported by Jones from Brown Pass. Wash. to Mont. and Wyo.—Densely tufted perennial, covered with appressed white hairs; leaves linear-oblanceolate, mostly basal; flowers blue, in short racemes; corolla 7 to 9 mm. broad.

4. MYOSOTIS L.

1. Myosotis alpestris Schmidt. FORGET-ME-NOT. Occasional above timber line, in meadows or on rock slides. Alaska to Colo.; also in Eur. and Asia.—Plants perennial, 10 to 30 cm. high, hairy; leaves oblanceolate, 3 to 6 cm. long, flowers in one-sided racemes, intense blue, 4 to 6 mm. wide; nutlets smooth.

A beautiful plant, closely related to the cultivated forget-me-not.

5. AMSINCKIA Lehm.

1. Amsinckia barbata Greene. FIDDLENECK. Dry open slopes at east entrance, perhaps introduced. B. C., Idaho, and Mont.—Annual, 20 to 40 cm. high, branched, covered with bristly yellowish hairs; leaves lanceolate to linear-oblong, 3 to 5 cm. long, alternate; flowers in long one-sided racemes; corolla bright yellow, 5 mm. long.

The hairs are so stiff and sharp that they penetrate the skin easily.

6. LITHOSPERMUM L.

1. Lithospermum ruderale Lehm. PUCCOON. Common on the east slope at low altitudes, on prairie or open hillsides. B. C. to Nev., Colo., and Alta. (*L. lanceolatum* Rydb.)—Perennial, 25 to 50 cm. high, the stems forming dense clumps, hairy; leaves alternate, linear or lanceolate, 3 to 10 cm. long; flowers in leafy spikes; corolla about 1 cm. long, greenish yellow.

The flowers appear early in the season. The nutlets are pale, shining, and very hard.

7. CRYPTANTHA Lehm.

1. Cryptantha affinis (A. Gray) Greene. East entrance, along railroad, *Umbach*. Wash. to Calif., Utah, and Mont.—Annual, 10 to 30 cm. high, hairy, branched; leaves linear, 2 to 3 cm. long; flowers in one-sided racemes; corolla white, about 1.5 mm. wide.

8. OREOCARYA Greene.

1. Oreocarya glomerata (Pursh) Greene. Occasional on the east slope at low altitudes, on prairie or dry open slopes or flats. B. C. to Utah and Nebr.—Perennial, 15 to 30 cm. high, very hairy, grayish, stout; leaves alternate, the basal ones spatulate, 2 to 6 cm. long, obtuse; inflorescence long, narrow, leafy; corolla white, 5 to 8 mm. wide; nutlets narrow, acute, slightly roughened on the back.

The plant is so densely covered with stiff sharp hairs that it is almost as unpleasant to handle as a nettle.

9. ALLOCARYA Greene.

Annuals, much branched; lowest leaves opposite, the others alternate, linear; flowers very small, in one-sided racemes, leafy-bracted; corolla white.

Plants covered with short stiff hairs . . . . . **1. A. californica.**
Plants nearly glabrous, with only a few inconspicuous hairs . . . . **2. A. orthocarpa.**

1. Allocarya californica (Fisch. & Mey.) Greene. East entrance, in wet open ground and about dried-up pools on prairie. Wash. to Calif., N. Mex., and N. Dak. (*A. scopulorum* Greene.)—Plants slender, much branched from the base, spreading; leaves 1.5 to 4 cm. long.

2. Allocarya orthocarpa Greene. Wet ground at east entrance, *Umbach*. Mont. to Utah and Wyo.—Plants green, loosely branched; leaves 2 to 5 cm. long.

The specimens are immature and the determination is not certain.

76. VERBENACEAE. Vervain Family.

1. VERBENA L. Vervain.

The cultivated verbenas belong to this genus.

1. Verbena bracteosa Michx. Carpet vervain. Along the railroad near Belton, probably introduced. B. C. to Calif., Ill., and Fla.—Prostrate hairy plant; leaves opposite, deeply lobed; flowers purplish, small, in dense spikes; corolla 5-lobed; fruit of 4 small nutlets in the bottom of the calyx.

An inconspicuous weed.

77. MENTHACEAE. Mint Family.

Annual or perennial herbs, often with a strong odor; stems 4-angled; leaves opposite, toothed; corolla usually very irregular and 2-lipped; stamens 4 or 2; fruit consisting of 4 small nutlets in the bottom of the calyx.

Flowers in small dense clusters in the axils of the leaves; corolla not 2-lipped, 4 or 5-toothed.
  Anther-bearing stamens 2; plants glabrous or nearly so . . . . . **1. LYCOPUS.**
  Anther-bearing stamens 4; plants finely hairy . . . . . **2. MENTHA.**
Flowers all or mostly in spikes or heads at the ends of the branches; corolla 2-lipped.
  Anther-bearing stamens 2; flowers 2 to 2.5 cm. long, in long-stalked heads. **3. MONARDA.**
  Anther-bearing stamens 4; flowers 1.5 cm. long or less, mostly in spikes.
    Calyx lobes very unequal, 3 of them broad and large and 2 narrow and small; flowers purple . . . . . **4. PRUNELLA.**
    Calyx lobes not very unequal or, if so, one of the teeth longer than the other 4; flowers white, pink, or pale blue.
      Plants glabrous or nearly so; one of the calyx lobes larger than the other 4; corolla pale blue, only slightly longer than the calyx. **5. MOLDAVICA.**

Plants conspicuously hairy; calyx lobes nearly alike in size; corolla white or pink, much longer than the calyx.
Plants pale with a covering of soft whitish matted hairs; leaves with rounded teeth; calyx 15-ribbed . . . . . **6. NEPETA.**
Plants green, covered with spreading hairs; leaves with sharp teeth; calyx 5 to 10-ribbed . . . . . **7. STACHYS.**

1. LYCOPUS L. WATER HOREHOUND.

Perennials, odorless, glabrous or nearly so; leaves toothed or lobed; flowers small, whitish, scarcely longer than the calyx, clustered in the axils of the leaves.
Calyx teeth mostly obtuse, shorter than the nutlets; leaves toothed.
1. L. uniflorus.
Calyx teeth very acute, longer than the nutlets; leaves lobed, at least near the base.
2. L. americanus.

1. Lycopus uniflorus Michx. Frequent at low altitudes on the west slope, in sphagnum bogs or swampy thickets. B. C. to Oreg., Va., and Newf. (*L. communis* Bickn.)—Plants slender, with long slender runners; rootstocks thickened and tuber-like; leaves sharply toothed, 2.5 to 6 cm. long; corolla 2 to 3 mm. long.

2. Lycopus americanus Muhl. Swamp at Belton, *Umbach*. B. C. to Calif., Fla., and Newf.—Stems mostly simple, 20 to 40 cm. high, often purplish below; leaves 3 to 8 cm. long, petioled.

2. MENTHA L.

1. Mentha canadensis L. AMERICAN MINT. Common at low altitudes, in low meadows or swamps or along streams. Widely distributed in N. Amer.—Plants erect or nearly prostrate, with a strong odor; leaves 2 to 5 cm. long, sharply toothed; flowers small, pink.

The species is a variable one, some of whose forms are often considered to be distinct species. The Blackfoot Indians used the leaves for making a tea and for flavoring dried meat.

3. MONARDA L.

1. Monarda menthaefolia Benth. HORSEMINT. Frequent at low altitudes, on dry open rocky slopes or in thin woods. Idaho to Utah, Tex., and Ill.—Plants 30 to 80 cm. high, finely and closely hairy; leaves ovate, short-stalked, toothed; flowers rose-colored, in large dense heads.

A showy plant, with a strong and distinctive odor.

4. PRUNELLA L.

1. Prunella vulgaris L. HEAL-ALL. Common at low and middle altitudes, usually in woods or in wet thickets, along streams, etc.; sometimes in sphagnum bogs. Widely distributed in N. Amer., Eur., and Asia.—Plants 10 to 40 cm. high, usually in small clumps, nearly glabrous; leaves ovate or oblong, 3 to 8 cm. long, stalked, entire or with low rounded teeth.

A handsome plant when in full flower. Known also as self-heal or carpenter-weed.

5. MOLDAVICA Adans.

1. Moldavica parviflora (Nutt.) Britton. DRAGONHEAD. At low and middle altitudes, usually along trails or in waste places; rather scarce and perhaps introduced. Alaska to Ariz. and N. Y.—Annual or biennial, 30 to 60 cm. high; leaves lanceolate or oblong, coarsely toothed, the teeth often with spinelike tips.

An inconspicuous weedy plant.

6. NEPETA L.

1. Nepeta cataria L. CATNIP. A few plants found about the head of Lake McDonald. Native of Eur.; introduced in many parts of N. Amer.—Perennial; leaves ovate or heart-shaped, grayish, 2 to 7 cm. long, stalked; flowers white or pale pink.

7. STACHYS L.

1. Stachys scopulorum Greene. HEDGE-NETTLE. About the east entrance, in low moist places. Wash. to N. Mex. and Minn.—Perennial, 30 to 60 cm. high, very hairy; leaves oblong-lanceolate, 5 to 10 cm. long, stalked; flowers pink.

78. SCROPHULARIACEAE. Figwort Family.

Annual or perennial herbs; leaves alternate or opposite, without stipules; flowers irregular; calyx of 5 or 4 more or less united sepals; corolla usually 2-lipped; stamens usually 4 or 2, a fifth sterile one (without an anther) often present, attached to the tube of the corolla; fruit a 2-celled capsule.

Plants stemless, the leaves all rising from the root . . . . . **6. LIMOSELLA.**
Plants with leafy stems.
Leaves alternate.
Bracts at the base of the flowers tinged with red, pink, or yellow, more conspicuous than the flowers and usually nearly or fully as long. **10. CASTILLEJA.**
Bracts green, less conspicuous and usually much shorter than the flowers.
Capsule notched at the top; corolla none; leaves with fine rounded teeth. **9. SYNTHYRIS.**
Capsule not notched; corolla present; leaves entire, lobed, or toothed.
Stamens 5; corolla yellow or white, not 2-lipped . . . . . **1. VERBASCUM.**
Stamens 4; corolla of various colors, 2-lipped.
Leaves toothed or lobed . . . . . **12. PEDICULARIS.**
Leaves entire.
Plants perennial, glabrous or nearly so; corolla with a spur at the base. **2. LINARIA.**
Plants annual, hairy; corolla not spurred . . . **11. ORTHOCARPUS.**
Leaves opposite.
Leaves deeply lobed . . . . . **12. PEDICULARIS.**
Leaves entire or toothed.
Calyx 4-lobed.
Flowers white or blue; capsule notched at the top . . . . . **8. VERONICA.**
Flowers yellow; capsule not notched.
Leaves entire; calyx not large and inflated in fruit. **14. MELAMPYRUM.**
Leaves toothed; calyx large and inflated in fruit . . **13. RHINANTHUS.**
Calyx 5-lobed, or of 5 nearly distinct sepals.
Stamens 2; flowers less than 1 cm. long, white or yellowish white; plants of wet soil . . . . . **7. GRATIOLA.**
Stamens 4 or 5; flowers small or large; plants of wet or dry soil.
Corolla 4 to 6 mm. long (blue); plants annual . . . . . **3. COLLINSIA.**
Corolla 1 cm. long or larger; plants perennial.
Calyx not angled, the lobes longer than the tube; stamens 5, one of them without an anther . . . . . **4. PENTSTEMON.**
Calyx angled, the tube longer than the lobes; stamens 4. **5. MIMULUS.**

1. VERBASCUM L.

Biennials, more or less hairy; leaves alternate; flowers in spikes or racemes; corolla flat, only slightly irregular.

Plants densely woolly; flowers in a long dense spike . . . . . **1. V. thapsus.**
Plants nearly glabrous; flowers in loose racemes . . . . . **2. V. blattaria.**

1. Verbascum thapsus L. MULLEN. One plant seen on east slope on trail to Iceberg Lake; occasional about Lake McDonald, and up to Sperry Chalets; rather plentiful at Belton. Native of Eur.; naturalized in N. Amer.—Plants 1 to 2 meters high, with a dense covering of pale feltlike hairs; leaves spatulate or oblanceolate, 10 to 40 cm. long; spikes 10 to 50 cm. long; flowers yellow, 1 to 2 cm. wide.

2. Verbascum blattaria L. MOTH MULLEN. A few plants at Sun Camp and at Lewis's. Native of Eur.; naturalized in N. Amer.—Plants 30 to 80 cm. high, green; leaves oblong or obovate, 4 to 10 cm. long, coarsely toothed or lobed; flowers white or yellow, about 3 cm. broad.

2. LINARIA L.

1. Linaria vulgaris Mill. BUTTER-AND-EGGS. A few plants at Belton, Lewis's, and just below Sperry Chalets. Native of Eur.; naturalized in N. Amer.—Glabrous perennial, pale green, 20 to 50 cm. high; leaves alternate, linear, entire, 2 to 5 cm. long; flowers in racemes; corolla 2-lipped, 2 to 3 cm. long, pale yellow with orange throat, the tube with a spur at base; stamens 4.

The plant has a characteristic odor.

3. COLLINSIA Nutt.

1. Collinsia parviflora Dougl. BLUELIPS. Frequent at low and sometimes at middle altitudes, in woods or thickets or on open slopes. B. C. to Calif., Ariz., and Ont.—Branched annual, 10 to 30 cm. high, minutely hairy; leaves opposite, oblong to linear, entire or nearly so; flowers slender-stalked, in the axils of the leaves; corolla pale blue, 2-lipped, 4 to 6 mm. long.

4. PENTSTEMON Schmidel. BEARDTONGUE.

Perennials with leafy stems; leaves opposite, entire or toothed; flowers showy, in racemes or panicles; calyx deeply 5-cleft; corolla somewhat 2-lipped, with 5 lobes; fertile stamens 4, a fifth sterile one also present, this often bearded.

Corolla yellowish white . . . . . **1. P. confertus.**
Corolla blue or purple.
  Corolla 0.8 to 2 cm. long, blue.
    Corolla 1 cm. long or shorter, with a narrow tube; calyx lobes with long slender tips . . . . . **2. P. procerus.**
    Corolla about 1.5 cm. long, with a broad tube; calyx lobes acute or short-pointed.
      Leaves, at least most of them, finely toothed, bright green; plants with glands, at least on the calyx . . . . . **3. P. virens.**
      Leaves all entire, glaucous; plants glabrous . . . . . **4. P. nitidus.**
  Corolla 2.5 to 4 cm. long, pale or deep purple.
    Anthers glabrous; sterile stamen bearded . . . . . **5. P. erianthera.**
    Anthers woolly; sterile stamen not bearded.
      Leaves rounded to oblong, 1 to 3 cm. long, most of them petioled; plants usually less than 20 cm. high . . . . . **6. P. ellipticus.**
      Leaves linear-lanceolate, 4 to 10 cm. long, mostly sessile; plants usually 30 to 50 cm. high.
        Leaves glabrous . . . . . **7. P. lyallii.**
        Leaves finely hairy . . . . . **8. P. linearifolius.**

1. Pentstemon confertus Dougl. YELLOW BEARDTONGUE. Common at low altitudes, in moist woods or thickets or on open slopes or prairie; sometimes on slopes or in woods at middle altitudes, and occasionally above timber line. B. C. to Calif., Wyo., and Alta.—Plants glabrous, 15 to 50 cm. high, often forming small clumps; leaves mostly lanceolate, 3 to 10 cm. long, entire; flowers in narrow, long or short panicles; corolla 1 cm. long.

Unlike most species of the genus, this is a rather inconspicuous plant. The corolla is of a much deeper and brighter yellow when dried than when fresh.

2. Pentstemon procerus Dougl. In meadows or on prairie at east entrance. B. C. to Calif., Colo., and Sask.—Plants glabrous or nearly so, 15 to 40 cm. high; leaves 4 to 8 cm. long, oblanceolate or narrowly or broadly lanceolate, entire; flowers in narrow, short or long, dense panicles; corolla deep purplish blue.

3. Pentstemon virens Pennell. BLUE BEARDTONGUE. Frequent at low and middle altitudes, on open slopes or on prairie; occasionally in meadows above timber line. Alta. to Colo. and Nev.—Stems 10 to 30 cm. high, usually tufted; leaves ovate, lanceolate, or oblanceolate, 2 to 5 cm. long, many of them entire; corolla deep blue or purplish blue.

A very handsome plant, which remains in flower only a short time. It occurs mostly in isolated tufts, never in great abundance.

4. Pentstemon nitidus Dougl. Occasional on the east slope at low altitudes, on prairie or open hillsides. Wash. to Wyo. and S. Dak.—Stems 20 to 30 cm. high, often in clumps, stout; leaves ovate, lanceolate, or oblanceolate, 3 to 5 cm. long, thick; panicle narrow, with large rounded-ovate bracts; corolla blue.

The Blackfoot Indians used a decoction of the plant as a remedy for cramps and pains in the stomach.

5. Pentstemon erianthera Pursh. East entrance, on bluffs, *Umbach*. Wash. to Nev., Nebr., and N. Dak.—Stems 10 to 30 cm. high, stout, hairy; leaves oblanceolate or linear, 4 to 10 cm. long, finely hairy, usually toothed.

6. Pentstemon ellipticus Coult. & Fish. ALPINE BEARDTONGUE. Common above timber line, chiefly on rock slides; occasional at middle altitudes, especially near snow banks or on open rocky slopes. Alta., Mont., and Idaho.—Plants 10 to 20 cm. high, often somewhat woody at the base, forming low broad dense clumps; stems minutely hairy, the calyx with gland-tipped hairs; flowers few, purple, 3 to 3.5 cm. long.

One of the most showy plants of alpine rock slides, usually covered with large handsome flowers. The plants bloom for a long time.

7. Pentstemon lyallii A. Gray. Frequent at low and middle altitudes and sometimes near timber line, usually on open rocky slopes. B. C., Idaho, Mont., and Alta.—Stems glabrous or nearly so, usually in dense clumps; leaves finely toothed; corolla 3 to 4 cm. long, pale purple.

A showy plant, with flowers much like those of *P. ellipticus*.

8. Pentstemon linearifolius Coult. & Fish. Occasional on the east slope at low and middle altitudes, on open rocky hillsides or shale slides; sometimes on slopes above timber line. Idaho and Mont.—Stems finely hairy, in dense clumps; leaves finely toothed or entire; corolla purple to purplish pink.

Perhaps only a form of *P. lyallii;* there seems to be no marked difference between the two in size of corolla. One plant collected at Cracker Lake had white flowers.

5. MIMULUS L. MONKEYFLOWER.

Plants usually perennial, somewhat succulent; leaves opposite, shallowly toothed; flowers large or small, borne in the leaf axils or arranged in leafy racemes; calyx 5-lobed, angled; corolla 2-lipped; stamens 4.

Corolla rose-red . . . . . **1. M. lewisii.**
Corolla yellow.
Stems covered with long weak hairs; calyx lobes nearly equal in length.
2. M. moschatus.
Stems glabrous or with minute hairs; calyx lobes very unequal.
Corolla 25 to 30 mm. long . . . . . **3. M. caespitosus.**
Corolla 5 to 15 mm. long.
Calyx lobes obtuse; corolla 8 to 15 mm. long . . . . . **4. M. glabratus.**
Calyx lobes acute; corolla 5 to 8 mm. long . . . . . **5. M. hallii.**

1. Mimulus lewisii Pursh. RED MONKEYFLOWER. Common about timber line and frequently found along streams at middle elevations; in wet ground, especially along streams. B. C. to Calif., Colo., and Minn.—Stems 30 to 60 cm. high, usually tufted, finely hairy and somewhat viscid; leaves oblong or ovate, 4 to 8 cm. long, sharply toothed; corolla 3.5 to 5 cm. long.

A showy plant, often growing in dense masses, especially along brooks.

2. Mimulus moschatus Dougl. MUSKFLOWER. Infrequent; near Sun Camp and along Snyder Creek; in wet thickets or along brooks in deep woods. B. C. to Calif., Colo., and Ont.—Stems slender, prostrate or creeping, very viscid; leaves slender-stalked, ovate, 2 to 5 cm. long, finely toothed.

This species is often cultivated, but it is far from being a showy plant in its wild state.

3. Mimulus caespitosus Greene. YELLOW MONKEYFLOWER. Common above or near timber line, usually along brooks or on wet banks. B. C. to Calif., Colo., and Mont.—Stems 10 to 20 cm. high, usually forming dense clumps; leaves broadly ovate or rounded, 1 to 2 cm. long, sessile or short-stalked; flowers usually 2 or 3 on each stem; corolla bright yellow, the throat spotted with brownish purple.

One of the most handsome plants of the park, frequently occurring in the greatest profusion. In Rydberg's Flora this is united with *M. langsdorfii* Don, but in size and in habit of growth it is very unlike the common forms of that species. The plants of Glacier Park are quite uniform in size and habit.

4. Mimulus glabratus H. B. K. Baring Falls, on wet mossy cliffs. Mont. to Ill., Mex., and S. Amer.—Stems long and weak, glabrous, prostrate or nearly so; leaves rounded, 1 to 4 cm. long, sparsely toothed, short-stalked; flowers few, in the leaf axils.

5. Mimulus hallii Greene. Baring Falls, on mossy cliff in the spray of the falls. Mont. to Colo.—Stems slender, 5 to 15 cm. long, glabrous; leaves rounded or broadly ovate, 0.5 to 1.5 cm. long, entire or slightly toothed.

The Glacier Park plants are only 3 to 5 cm. high and are, therefore, much smaller than is usual in the species. The specimens were determined by Mrs. A. L. Grant as a depauperate form ot *M. hallii.*

6. LIMOSELLA L.

1. Limosella aquatica L. MUDWORT. East entrance, about pools, *Umbach.* B. C. to Calif., N. Mex., and Lab.; also in Eur. and Asia.—Annual, with slender runners; leaves oval to oblanceolate, 0.5 to 3 cm. long, entire, obtuse, on very long slender petioles; flowers solitary on slender stalks; corolla white, 2 mm. long, 5-lobed.

7. GRATIOLA L.

1. Gratiola ebracteata Benth. Wet open places at east entrance. B. C. to Calif. and Mont.—Annual, 3 to 15 cm. high, branched, nearly glabrous, with stout succulent stems; leaves linear or lanceolate, 1 to 3 cm. long, sessile, entire or finely toothed; flowers in the axils of the leaves, stalked; corolla yellowish white, 6 to 8 mm. long.

8. VERONICA L. Speedwell.

Annuals or perennials; leaves opposite, entire or toothed; flowers small, in racemes or spikes or solitary in the axils of the leaves; corolla flat, almost regularly 4-lobed; stamens 2; capsule flat, usually notched at the apex.

Flowers solitary in the axils of the leaves; plants annual . **1. V. peregrina xalapensis.**
Flowers in spikes or racemes; plants perennial.
  Racemes in the axils of the leaves.
    Leaves short-petioled, ovate to oblong . . . . . **2. V. americana.**
    Leaves sessile, linear or nearly so . . . . . **3. V. scutellata.**
  Racemes terminal (at the ends of the stems).
    Racemes loosely hairy, the flowers crowded; leaves all sessile; stems erect. **4. V. wormskjoldii.**
    Racemes minutely hairy, loosely flowered; lower leaves petioled; stems creeping. **5. V. serpyllifolia.**

1. Veronica peregrina xalapensis (H. B. K.) Pennell. Purslane speedwell. Frequent at low altitudes, in moist woods or thickets, on open slopes, or about ponds on prairie. B. C. to Mex. and Tex. (*V. xalapensis* H. B. K.)—Plants 10 to 30 cm. high, usually branched, finely glandular-hairy; leaves linear to spatulate, finely toothed, the lowest ones short-petioled; corolla white, 2 to 3 mm. broad.

The typical form of the species is a native of Europe, and is naturalized in eastern North America.

2. Veronica americana Schwein. American brooklime. Common at low and sometimes at middle altitudes, in wet woods or thickets or along streams and lakes, sometimes growing in water. Alaska to Calif., N. Mex., Va., and Newf.—Plants usually branched and nearly prostrate, glabrous; leaves mostly toothed; flowers long-stalked; corolla blue or bluish white, 4 to 5 mm. broad.

3. Veronica scutellata L. Marsh speedwell. Frequent at low altitudes, in wet thickets or about ponds. B. C. to Calif., Colo., N. Y., and Newf.; also in Eur. and Asia.—Plants slender, often prostrate, glabrous or nearly so; leaves finely toothed or entire; corolla 6 to 8 mm. broad, blue; capsule notched at both ends.

4. Veronica wormskjoldii Roem. & Schult. Alpine speedwell. Frequent in meadows above timber line, sometimes found in wet places at middle altitudes. Alaska to N. Mex., S. Dak., N. H., and Greenl.—Stems simple, 10 to 25 cm. high, hairy above; leaves oval or ovate, 1 to 3 cm. long, entire or with low rounded teeth; corolla deep blue, 4 to 5 mm. broad.

The flowers are rather attractive, but the plants are usually half hidden by grasses and sedges. At Sexton Glacier many plants with pink flowers are found.

5. Veronica serpyllifolia L. Thyme-leaf speedwell. Frequent at low and middle altitudes, in moist woods or thickets or along streams. Alaska to Calif., N. Mex., Ga., and Lab.; also in Eur. and Asia.—Plants 5 to 15 cm. high, with creeping stems; leaves oblong to rounded, 5 to 15 mm. long, entire or with low rounded teeth; corolla whitish or pale blue, 3 to 4 mm. broad.

9. SYNTHYRIS Benth.

1. Synthyris wyomingensis (A. Nels.) Heller. Kittentails. Occasional on the east slope at low altitudes, on dry rocky slopes or prairie. Idaho to Colo. and S. Dak. (*Besseya wyomingensis* Rydb.)—Perennial, 15 to 30 cm. high, with woolly pubescence; leaves mostly basal, long-petioled, ovate or oblong, 3 to 5 cm. long, with low rounded teeth; flowers in dense spikes; corolla none; stamens 2.

The flowers open early in the season.

10. CASTILLEJA Mutis. INDIAN PAINTBRUSH.

Perennials, often parasitic upon the roots of other plants; stems simple or with a few branches above; leaves sessile, entire or lobed, those among the flowers (bracts) colored with red or yellow; flowers in dense spikes; corolla 2-lipped, the upper lip (galea) long and narrow, the lower lip 3-lobed.—The species are poorly understood, and whether all those listed below are valid is doubtful. The bracts exhibit great variation in color in each species. It seems probable to the writer that the species hybridize freely. The plants, especially those with red bracts, are very showy, and they are among the most conspicuous and abundant flowers of the park. In many places they are extremely abundant and offer an almost solid field of color.

Galea less than 3 times as long as the lip, half as long as the corolla tube or shorter; bracts tinged with yellow.
  Leaves, at lease most of them, lobed . . . . . 1. C. lutea.
  Leaves entire, or only the uppermost lobed.
    Stems 25 to 50 cm. high; spikes only slightly hairy, mostly with short hairs; corolla about 2.5 cm. long . . . . . 2. C. sulphurea.
    Stems usually less than 20 cm. high; spikes very hairy, with long whitish hairs; corolla about 1.8 cm. long . . . . . 3. C. occidentalis.
Galea several times longer than the very short lip, usually at least two-thirds as long as the corolla tube; bracts tinged with red or pink, except in occasional abnormal plants.
  Leaves, at least most of them, conspicuously lobed.
    Corolla 2 to 2.5 cm. long, only slightly if at all longer than the bracts. 4. C. bradburyi.
    Corolla about 3 cm. long, much longer than the bracts . . . . . 5. C. ampliflora.
  Leaves entire, or only the uppermost sometimes lobed.
    Bracts entire, obtuse, broad, sometimes 3-lobed, but then with a broad obtuse middle lobe.
      Corolla about 3 cm. long . . . . . 6. C. rhexifolia.
      Corolla 2 to 2.5 cm. long . . . . . 7. C. lauta.
    Bracts lobed, with narrow acute lobes, occasionally entire but then acute.
      Corolla 3.5 to 4 cm. long . . . . . 8. C. vreelandii.
      Corolla 3 cm. long or shorter.
        Corolla about 2 cm. long . . . . . 9. C. miniata.
        Corolla about 3 cm. long . . . . . 10. C. lancifolia.

1. Castilleja lutea Heller. Occasional at low altitudes, on prairie or open slopes. Wash. to Mont.—Stems simple, 20 to 30 cm. high, hairy; leaves 2 to 5 cm. long, 3 or 5-ribbed; corolla about 2.5 cm. long; bracts pale sulphur-yellow.

2. Castilleja sulphurea Rydb. Occasional on the east slope at low altitudes, on prairie or open hillsides. Mont. to Utah, N. Mex., and S. Dak.—Stems finely hairy, often branched; leaves lanceolate, 3 to 5 cm. long, 3-ribbed.

3. Castilleja occidentalis Torr. Common above timber line, in meadows or on rock slides. B. C. and Alta. to Colo.—Stems 10 to 20 cm. high, simple, usually tufted, finely hairy below; leaves linear or linear-lanceolate, 1.5 to 4 cm. long; bracts pale yellow-green or sometimes dirty pink.

4. Castilleja bradburyi (Nutt.) Don. Occasional on the east slope at low and middle altitudes, in thin woods or on open hillsides. B. C. to Oreg., Wyo., and Mont.—Stems 20 to 40 cm. high, sometimes branched, usually in clumps; leaves 3-ribbed, 3 to 5 cm. long, with few linear lobes; bracts scarlet or sometimes orange or bright yellow.

The plants are scattered and it is unusual to find many in a place. This is the only species of the park which has distinctly scarlet bracts.

5. Castilleja ampliflora Rydb. Occasional in woods or thickets at low altitudes; the type was collected between McDonald and Camas lakes. Mont.—Stems 30 to 40 cm. high, hairy; leaves 2 to 5 cm. long, hairy; bracts crimson.

6. Castilleja rhexifolia Rydb. Frequent at low, middle, and high altitudes, usually in moist meadows. Alaska to Colo. and Sask.—Stems 30 to 50 cm. high, simple, usually glabrous below, hairy above; leaves lanceolate or ovate, 3 to 5 cm. long, 3 or 5-nerved; bracts magenta or pale crimson.

7. Castilleja lauta A. Nels. Common above timber line, in meadows; occasionally found in moist meadows at middle altitudes. Oreg. to Colo. and Mont.—Stems 20 to 40 cm. high, usually glabrous below and hairy above, often clustered; leaves lanceolate or linear-lanceolate, 2 to 5 cm. long; bracts pale or deep crimson-pink, sometimes pinkish white or yellow-green tinged with pink.

8. Castilleja vreelandii Rydb. Occasional on the west slope at low or middle altitudes; the type was collected between McDonald and Camas lakes. Wash. to Wyo. and Mont.—Stems 40 to 70 cm. high, glabrous or nearly so; leaves lanceolate or linear-lanceolate, 4 to 9 cm. long, 3 or 5-ribbed.

9. Castilleja miniata Benth. Frequent at nearly all altitudes, in meadows, woods, or thickets or on open slopes. Wash. to Mont. and Sask.—Stems 40 to 60 cm. high, sometimes branched above, hairy or nearly glabrous; leaves lanceolate or linear, 3 to 7 cm. long; bracts crimson-pink or rarely pale pink or nearly scarlet.

10. Castilleja lancifolia Rydb. Frequent at low, middle, or high altitudes, in meadows or thickets or on open slopes. Alaska to Oreg., Colo., and Alta.—Stems usually solitary, 30 to 70 cm. high, sparsely hairy or glabrous, often branched above; leaves lanceolate, 3-nerved, 3 to 6 cm. long; bracts crimson or pink, or sometimes almost scarlet.

This and the five preceding species are alike in general appearance, and it is hard to distinguish them in the field. They grow together and seem to be about equally abundant.

11. ORTHOCARPUS Nutt.

1. Orthocarpus luteus Nutt. OWL-CLOVER. Low prairie at east entrance. B. C. to Ariz. and Nebr.—Annual, 10 to 30 cm. high, simple or branched, hairy; leaves alternate, linear or linear-lanceolate, 1.5 to 4 cm. long, usually entire; flowers in dense leafy spikes; corolla yellow, 10 to 15 mm. long, 2-lipped.

This was used by the Blackfoot Indians for dyeing gopher skins red. The plant was macerated and pressed firmly upon the skin.

12. PEDICULARIS L.

Erect perennials, glabrous or nearly so; leaves opposite or alternate, toothed or lobed; flowers in spikes; calyx 2 to 5-lobed; corolla strongly 2-lipped, the upper lip often with a short or long beak, the lower lip 3-lobed; stamens 4.

Leaves merely toothed, not lobed . . . . . **1. P. racemosa.**
Leaves deeply lobed.
  Upper lip of corolla with a long slender upcurved beak . . . . . **2. P. groenlandica.**
  Upper lip with an incurved beak or with none.
    Upper lip with an incurved beak; corolla white or nearly so . . . **3. P. contorta.**
    Upper lip not beaked; corolla greenish yellow or reddish green . . **4. P. bracteosa.**

1. Pedicularis racemosa Dougl. At middle altitudes or near timber line, rather scarce; on rock slides or in woods or thickets. B. C. to Calif., N. Mex., and Alta.—Stems 30 to 40 cm. high, in clumps; leaves lanceolate, 3 to 6 cm. long; corolla creamy white, 12 to 15 mm. long, the upper lip with an incurved beak.

2. Pedicularis groenlandica Retz. ELEPHANTHEAD. Common above timber line, in wet meadows, and often abundant in bogs or wet meadows at low and middle

altitudes. Alaska to Calif., N. Mex., Lab., and Greenl. (*Elephantella groenlandica* Rydb.)—Stems 10 to 40 cm. high, often in clumps; leaves 5 to 15 cm. long, divided into numerous linear or lanceolate lobes; spikes dense, many-flowered; corolla reddish purple, about 1 cm. long.

A rather conspicuous plant, but soon out of flower. The flowers bear a striking resemblance to an elephant's head, the long beak suggesting the trunk and two of the lower lobes the ears.

3. Pedicularis contorta Benth. ALPINE LOUSEWORT. Frequent above timber line, especially on rock slides, and occasionally at middle altitudes on moist rocky slopes. B. C. to Calif. and Mont.—Stems 15 to 30 cm. high, in clumps; leaves 6 to 12 cm. long, divided into numerous toothed linear lobes; flowers yellowish white, in dense spikes, about 1 cm. long.

4. Pedicularis bracteosa Benth. INDIAN WARRIOR. Common at nearly all altitudes, in moist woods or thickets, in alpine meadows, or on open slopes. B. C. to Calif., Colo., and Alta. (*P. montanensis* Rydb.)—Stems mostly solitary, 30 to 80 cm. high; leaves 10 to 30 cm. long, divided into numerous toothed lanceolate lobes; flowers 1.5 to 2 cm. long, in long spikes.

Plants with green corollas and others with dull red ones are often found together. The latter form is *P. montanensis*, but it appears to be only a color form rather than a distinct species.

13. RHINANTHUS L.

1. Rhinanthus crista-galli L. YELLOW RATTLE. Occasional on the east slope at low altitudes, in marshes or low thickets. Wash. to Colo., Md., and N. S.—Erect annual, 15 to 50 cm. high, nearly glabrous, simple or with few branches above; leaves opposite, lanceolate to linear, toothed, sessile; flowers in leafy spikes; corolla yellow, 8 mm. long; calyx enlarging in fruit, about 1.5 cm. long, compressed.

14. MELAMPYRUM L.

1. Melampyrum lineare Lam. COW-WHEAT. Frequent on the west slope at low and middle altitudes, usually in thin and rather dry woods. B. C. to Idaho, N. C., and N. S.—Annual, 10 to 30 cm. high, minutely hairy or nearly glabrous, usually with a few slender branches; leaves opposite, 2 to 6 cm. long, lanceolate or lance-linear, entire; flowers solitary in the leaf axils or in short leafy spikes; corolla 8 to 12 mm. long, whitish, often tinged with purple, 2-lipped; capsule flat.

79. PINGUICULACEAE. Butterwort Family.

Perennial herbs; flowers very irregular; corolla of united petals, 2-lipped, the corolla tube with a slender spur at the base; stamens 2; fruit a many-seeded capsule.

Plants submerged in water; leaves scattered along the slender stems, divided into numerous threadlike lobes; sepals 2 . . . . . **1. UTRICULARIA.**

Plants growing in wet soil; leaves all clustered at the base of the flower stalk, entire; sepals 5 . . . . . **2. PINGUICULA.**

1. UTRICULARIA L.

1. Utricularia minor L. YELLOW BLADDERWORT. Fish Lake, and probably in other lakes of the west slope. B. C. to Calif., N. J., and Greenl.—Leaves bearing small (2 mm. in diameter) bladders; flowers few, in a raceme on a slender stalk; corolla pale yellow, 4 to 6 mm. wide.

2. PINGUICULA L.

1. Pinguicula vulgaris L. BUTTERWORT. Wet soil at low and middle altitudes on the east slope; scarce, but abundant in some localities. Alaska to Wash., Vt., and Greenl.; also in Eur. and Asia.—Leaves elliptic or oval, 2 to 5 cm. long; stem 3 to 10 cm. high, 1-flowered; corolla purple, about 1 cm. wide.

The leaves are very fleshy; they seem greasy to the touch, hence the name butterwort. On their upper surface they produce a sticky secretion which entraps small insects and digests them for use as food by the plant. The handsome flowers strongly suggest those of a purple violet.

80. PLANTAGINACEAE. Plantain Family.

1. PLANTAGO L. Plantain.

Perennial herbs; leaves all basal, with conspicuous ribs, entire or somewhat toothed; flowers in very dense spikes, on long naked stalks; sepals 4, slightly united; corolla 4-lobed, thin and papery, greenish or brownish, often persistent in fruit; fruit a small capsule, opening by a caplike lid.

Leaves broadly ovate, 5 to 10 cm. wide or even broader, abruptly rounded at the base. **1. P. major.**

Leaves narrowly lanceolate, 1.5 cm. wide or narrower, long-tapering at the base. **2. P. septata.**

1. Plantago major L. Common plantain. Occasional at low altitudes, by roadsides, on open slopes, or in waste or cultivated ground. Widely distributed in temperate regions; native of Eur.—Leaves petioled, 5 to 25 cm. long, entire or coarsely toothed, glabrous or hairy, 5 or 7-ribbed; spikes 4 to 15 cm. long; capsule about 3 mm. long.

2. Plantago septata Morris. Plains at east entrance, *Umbach*. Alaska to Mont.—Leaves short-petioled, 8 to 12 cm. long, entire, hairy, 5-ribbed; spikes 3 to 6 cm. long.

81. RUBIACEAE. Madder Family.

1. GALIUM L. Bedstraw.

Annual or perennial herbs with 4-angled stems; leaves whorled, entire, narrow; flowers small, white, in cymes or panicles; calyx none; corolla 3 or 4-lobed; stamens 4; fruit of 2 united rounded carpels, dry, 2-seeded.

Fruit (and base of the flower) glabrous . . . . . **1. G. trifidum.**
Fruit covered with hooked hairs.
  Leaves mostly 6 in a whorl, bristle-pointed . . . . . **2. G. triflorum.**
  Leaves usually 4 (sometimes 2) in a whorl, rounded or obtuse at the apex.
    Plants annual; leaves 1-nerved; flowers solitary in the leaf axils. **3. G. bifolium.**
    Plants perennial; leaves 3-nerved; flowers panicled . . . . . **4. G. boreale.**

1. Galium trifidum L. Small bedstraw. Common, chiefly at low but sometimes at middle altitudes, in swamps, bogs, or wet thickets. Alaska to Colo., N. Y., and Lab.; also in Eur. and Asia.—Stems very slender, 10 to 40 cm. long, weak and usually reclining, rough on the angles; leaves usually 4 but sometimes 5 or 6 in a whorl, 1-nerved, 5 to 15 mm. long, blunt; flowers 1 to 3 on each peduncle; corolla white, 3-lobed, about 1.5 mm. broad.

2. Galium triflorum Michx. Sweet-scented bedstraw. Common nearly everywhere up to timber line, in bogs, wet thickets, or moist woods, sometimes on open slopes. Alaska to Calif., N. Mex., Ala., and Newf.—Stems weak, ascending, 30 to 60 cm. long, very rough on the angles; leaves oblanceolate, 2 to 4 cm. long, 1-ribbed; flowers mostly 3 on each peduncle; corolla white, 4-lobed.

3. Galium bifolium S. Wats. East entrance, in woods, *Umbach*. B. C. to Calif., Colo., and Mont.—Stems erect, slender, 10 to 15 cm. high, glabrous, usually simple; leaves 2 to 4 in a whorl, 8 to 15 mm. long.; flowers slender-stalked.

4. Galium boreale L. Baby's-breath. Common at all altitudes, on open slopes or rock slides or in woods or thickets. Widely distributed in N. Amer., Eur., and Asia.—Stems 15 to 60 cm. high, often in dense clumps, erect, stout, glabrous or nearly

so; leaves 4 in a whorl, linear or lanceolate, 2 to 5 cm. long; flowers white or yellowish white, in dense panicles, sweet-scented; corolla 4-lobed, about 3 mm. broad.

A showy plant, often forming dense masses. In the park it is sometimes called wild heliotrope, because of the fragrance of the flowers, but their odor does not resemble that of heliotrope.

82. CAPRIFOLIACEAE. Honeysuckle Family.

Shrubs or trailing plants with opposite leaves; petals united, the corolla 5-lobed and often 2-lipped; stamens 5 or sometimes 4; fruit drupelike or a berry, or sometimes dry.

Leaves pinnate, composed of 5 or 7 leaflets . . . . . **1. SAMBUCUS.**

Leaves simple, entire or lobed or toothed.

Plants slender, trailing over the ground; stamens 4; fruit small, dry. **2. LINNAEA.**

Plants erect shrubs; stamens 5; fruit juicy.

Flowers white, in a flat-topped cluster; leaves mostly 3-lobed and toothed; fruit 1-seeded . . . . . **3. VIBURNUM.**

Flowers pink or yellow, clustered in the leaf axils or on slender 2-flowered stalks; leaves mostly entire; fruit containing 2 or more seeds.

Flowers clustered in the leaf axils; corolla about 6 mm. long, pink; fruit white, 2-seeded . . . . . **4. SYMPHORICARPOS.**

Flowers 2 on a slender stalk; corolla about 20 mm. long, yellow or yellowish; fruit red or black, containing more than 2 seeds . . . . . **5. LONICERA.**

1. SAMBUCUS L.

1. Sambucus melanocarpa A. Gray. ELDERBERRY. Common, especially at middle altitudes, and frequently found above timber line; in moist woods or thickets, in meadows, or on open slopes. B. C. and Alta. to N. Mex. and Utah.—Shrub, 1 to 2 meters high, often forming large clumps, glabrous or nearly so; leaflets ovate to lanceolate, 5 to 20 cm. long, toothed; flowers sweet-scented, in dense cymes 4 to 6 cm. broad; corolla creamy white, flat; fruit black, about 5 mm. long, 3 to 5-seeded.

The fruit is juicy and rather sour, but of good flavor. It may be used for pies, jam, etc. The stems contain a large amount of pith.

2. LINNAEA L.

1. Linnaea borealis L. TWINFLOWER. Common on the west slope at low and middle altitudes, in deep or thin woods or on open hillsides; reported from the east slope, but not seen there by the writer. Alaska to N. Mex., N. J., and Greenl.; also in Eur. and Asia. (*L. americana* Forbes.)—Stems very slender, trailing and forming loose mats, finely hairy; leaves evergreen, 8 to 15 mm. long, rounded, with low rounded teeth; flowers 2, on a long slender stalk; corolla pink, 1 cm. long, funnel-shaped.

A very beautiful and delicate plant.

3. VIBURNUM L.

1. Viburnum pauciflorum Pylaie. HIGHBUSH CRANBERRY. Occasional on the west slope at low and middle altitudes, in moist woods or thickets. Alaska to Colo., Pa., and Newf.—Shrub, about 1 meter high; leaves 4 to 10 cm. broad, mostly subcordate at base, somewhat hairy; flower clusters 1 to 3 cm. broad; fruit red, about 1 cm. long.

The fruit is sour but of good flavor. Where the plant is abundant the fruit is often gathered and cooked, and it may be used as a substitute for cranberries, which it resembles in flavor.

4. SYMPHORICARPOS Ludw. Snowberry.

Shrubs with brown branches; leaves entire, or on young shoots often lobed, obtuse; corolla bell-shaped; fruit white.

Stamens not exserted from the corolla . . . . . **1. S. albus.**
Stamens shortly exserted from the corolla . . . . . **2. S. occidentalis.**

1. Symphoricarpos albus (L.) Blake. Common at low and middle altitudes, in thickets or thin or deep woods or on open slopes. B. C. to Calif., Colo., Va., and N. S.—Slender shrub, 0.5 to 1 meter high, nearly glabrous; leaves usually thin, oval or rounded, 2 to 5 cm. long; corolla pale or deep pink, bearded inside; fruit 6 to 10 mm. long, pure white, not edible.

A handsome shrub when loaded with its fruit; it is often seen in cultivation. The plants bloom for a long time, and flowers and ripe fruit are often found on the same bush.

2. Symphoricarpos occidentalis Hook. Frequent on the east slope at low altitudes, in thickets or thin woods or on prairie or open hillsides. B. C. to Colo., Mo., and Mich.—Similar to *S. albus*, but the leaves usually thicker; corolla deep pink.

5. LONICERA L.

Erect shrubs; leaves entire; corolla often 2-lipped; fruits 2 together, fleshy.—The various kinds of honeysuckle, many of which are vines, belong to this genus.

Fruit red; bracts at base of flowers small and inconspicuous; corolla 2-lipped.
1. L. utahensis.

Fruit black; bracts large and leaflike, at least in fruit; corolla almost regular.
2. L. involucrata.

1. Lonicera utahensis S. Wats. Red twinberry. Frequent at nearly all altitudes, in thickets or thin or deep woods or on open slopes; often growing about timber line, but most common at middle altitudes. B. C. to Utah and Mont. (*Xylosteon utahense* Howell.)—Shrub, 0.5 to 1 meter high, glabrous; leaves broadly oval or rounded, 3 to 6 cm. long, obtuse, pale green; corolla pale yellow, funnel-shaped; fruits partly united, 5 to 8 mm. long, bright red.

The fruits have an insipid flavor; they vary greatly in size, and those of a pair are usually very unequal.

2. Lonicera involucrata (Richards.) Banks. Black twinberry. Common at low and middle altitudes and often about timber line, in deep or thin woods, along streams, or on open slopes. Alaska to Calif., N. Mex., Mich., and Que. (*Distegia involucrata* Cockerell.)—Shrub, about a meter high, usually with few simple stems-leaves mostly ovate, 5 to 15 cm. long, hairy, acute; bracts in fruit large and wine; colored; corolla yellow, short-hairy, the stamens slightly exserted; fruit dull black, 8 to 10 mm. long.

The shrub is conspicuous in either flower or fruit, especially because of the handsome bracts. The fruit has an unpleasant flavor; it falls easily and does not remain long upon the bushes. The shrub is known locally in Montana as skunkberry.

83. VALERIANACEAE. Valerian Family.

1. VALERIANA L. Valerian.

Erect perennial herbs, nearly glabrous; leaves opposite, most of them pinnately lobed or divided; flowers white or pinkish, in loose or dense cymes, the staminate and pistillate flowers mostly on separate plants; calyx developing into hairy bristles; corolla funnel-shaped, 5-lobed; stamens usually 3; fruit dry, achene-like.—The roots have a strong peculiar odor which persists when they are dry.

Corolla of the pistillate flower 2 to 3 mm. long; fruit about 4 mm. long.
1. V. septentrionalis.

Corolla of the pistillate flower 5 to 8 mm. long; fruit about 6 mm. long.
2. V. sitchensis.

1. Valeriana septentrionalis Rydb. Occasional on the east slope at low or middle altitudes, in thickets or woods or on open slopes. B. C. to Nev., Que., and Lab.—Plants 20 to 70 cm. high; lowest leaves usually entire, the others pinnate, the leaflets lanceolate to oval, entire or toothed.

2. Valeriana sitchensis Bong. Common in meadows above and near timber line, and occasionally found at middle or even at low altitudes, on rock slides, along brooks, or in moist woods or thickets. Alaska to Oreg., and Mont. (*V. scouleri* Rydb.)—Plants 30 to 70 cm. high; leaflets 3 to 7, rounded-ovate to lanceolate, 2 to 7 cm. long, coarsely toothed to entire; corolla white or with a faint tinge of pink; stamens exserted.

A showy plant which blooms soon after the snow melts and continues in flower for a long time. *V. sitchensis scouleri* (Rydb.) Piper is a form with nearly entire leaflets, but all integrades are found between it and the typical form, which has coarsely toothed leaflets.

A hot drink made from this or other species was employed by the Blackfoot Indians as a remedy for stomach affections.

84. CAMPANULACEAE. Harebell Family.

1. CAMPANULA L.

1. Campanula rotundifolia L. HAREBELL. Common at all altitudes, usually in thin woods or on open slopes; frequent above timber line, even on rock slides. Alaska to Calif., N. Mex., and N. J.; also in Eur. and Asia. (*C. petiolata* A. DC.)—Perennial, 10 to 40 cm. high, very slender, nearly glabrous; basal leaves ovate or heart-shaped, 1 to 3 cm. long, toothed, slender-petioled; stem leaves linear; flowers few, in racemes, slender-stalked, drooping; corolla bell-shaped, bluish purple, 1.5 to 2 cm. long; fruit a capsule.

A very beautiful and graceful plant, often growing among grasses. The plants bloom all summer. Those of dry places often have very small corollas, 1 cm. long or even shorter. This species is the "bluebells of Scotland."

85. CICHORIACEAE. Chicory Family.

Annual or perennial herbs with milky juice; leaves alternate, or sometimes all at the base of the stem; flowers in heads as in the Asteraceae, but the flowers all with strap-shaped corollas; stamens 5, the anthers united into a tube; fruit an achene, with pappus of bristles at the apex.—By some authors this family is united with the Asteraceae.

Flower head one on each stem; stems naked.
- Achenes 10-ribbed or 10-nerved, smooth; bracts unequal and overlapping; flowers yellow or bronze . . . . . **1. AGOSERIS.**
- Achenes 4 or 5-ribbed, rough with spinelike projections, at least near the apex; main bracts equal in length, a few much shorter ones present at the base of the head; flowers yellow . . . . . **2. LEONTODON.**

Flower heads few to many on each stem; stems leafy.
- Achenes flattened; flowers blue or pale yellow; leaves usually lobed or with spiny teeth . . . . . **3. LACTUCA.**
- Achenes not flattened; flowers yellow or white; leaves usually entire or toothed, rarely lobed, never with spiny teeth . . . . . **4. SONCHUS.**

Pappus white; achenes tapering toward the apex.
  Pappus bristles hairy, dilated and chafflike at base . . . . **5. PTILOCALAIS.**
  Pappus bristles not hairy, slender throughout . . . . . **6. CREPIS.**
Pappus yellowish or brownish; achenes not tapering.
  Leaves not at all triangular, without lobes at the base; flowers white or yellow; plants hairy . . . . . **7. HIERACIUM.**
  Leaves more or less triangular, with lobes at the base; flowers white; plants glabrous . . . . . **8. PRENANTHES.**

1. AGOSERIS Raf. False dandelion.

Perennials with naked stems; leaves clustered at the base of the stem, entire, toothed, or lobed; heads solitary, large; flowers yellow or bronze, often turning purplish; pappus of slender white bristles.—It is necessary to have mature achenes in order to distinguish the species accurately. The species are difficult to distinguish, and poorly understood; it is doubtful whether all those listed below are valid.

Beak of the achene slender, nearly or fully as long as the body of the achene, scarcely ridged at the middle; flowers often bronze or orange.
  Leaves finely hairy . . . . . **1. A. elata.**
  Leaves glabrous or nearly so.
    Leaves with few or numerous narrow lobes . . . . . **2. A. graminifolia.**
    Leaves entire or slightly toothed . . . . . **3. A. gracilens.**
Beak short, ridged its whole length; flowers yellow.
  Leaves finely hairy.
    Outer bracts mostly oblong or oblong-ovate; leaves mostly entire . **4. A. villosa.**
    Outer bracts linear-lanceolate; leaves mostly lobed . . . . . **5. A. aspera.**
  Leaves glabrous or nearly so.
    Bracts glabrous on the back; leaves linear or nearly so . . . . . **6. A. glauca.**
    Bracts hairy on the back; leaves linear or broader.
      Leaves acute; outer bracts not much broader than the inner ones; plants mostly 20 to 40 cm. high . . . . . **7. A. scorzoneraefolia.**
      Leaves obtuse; outer bracts much broader than the inner ones; plants mostly 5 to 15 cm. high . . . . . **8. A. pumila.**

1. Agoseris elata (Nutt.) Greene. Occasional about the foot of Lake McDermott, on sandbars or open rocky slopes. B. C. to Calif., Colo., and Mont.—Leaves oblanceolate or nearly linear, lobed or toothed or some of them entire, green; stems stout, 30 to 50 cm. high, hairy; bracts hairy; flowers yellow or sometimes orange.

2. Agoseris graminifolia Greene. Frequent at middle and high altitudes, in meadows, on rocky slopes, or occasionally in woods; sometimes found above timber line on rock slides. B. C. and Alta. to Ariz.—Leaves linear, green, usually very numerous; stems 15 to 40 cm. high, hairy above; heads 2 cm. high, narrow; flowers bronze, turning purplish.

3. Agoseris gracilens. (A. Gray) Kuntze. Frequent at low altitudes on the east slope, on open hillsides or in thickets; sometimes in meadows above timber line. B. C. and Alta. to Colo.—Leaves oblanceolate, mostly entire, green or rather pale, obtuse or acute; stems 15 to 50 cm. high, hairy below the head; heads broad, about 2 cm. high; flowers orange or bronze, turning purplish.

4. Agoseris villosa Rydb. Frequent on the east slope at low, middle, and high altitudes, on rock slides or open slopes or in woods or thickets. B. C. and Alta. to Utah. (*Troximon villosum* A. Nels.)—Leaves lanceolate or oblanceolate, 6 to 12 cm. long, pale, acute; stems stout, 10 to 40 cm. high, hairy; heads broad, about 2 cm. high.

The plants from alpine localities are rarely much over 10 cm. high.

5. Agoseris aspera Rydb. Open slopes at Iceberg Lake. B. C., Idaho, and Mont.—Leaves 4 to 7 cm. long, pale; stems 5 to 12 cm. high, hairy; heads 10 to 15 cm. high, narrow.

6. Agoseris glauca (Nutt.) Greene. Frequent on the east slope at low altitudes, on open hillsides. B. C. and Wash. to Colo. and S. Dak. (*Troximon glaucum* Nutt.)—Leaves 8 to 20 cm. long, pale, narrowed to the tip; stems slender, 15 to 30 cm. high, glabrous.

7. Agoseris scorzoneraefolia (Schrad.) Greene. Frequent on the east slope at low altitudes, on open hillsides or flats; occasionally in alpine meadows. B. C. to Oreg., Colo., and S. Dak.—Leaves oblanceolate or linear-oblanceolate, 10 to 25 cm. long, pale or green, entire or toothed; stems 10 to 40 cm. high, hairy or glabrous; heads 2 to 3 cm. high, broad.

8. Agoseris pumila (Nutt.) Rydb. Exposed rocky slope above Sexton Glacier. Mont. to Colo. (*Troximon pumilum* Nutt.)—Leaves 3 to 10 cm. long, pale, entire or slightly toothed; stems mostly 5 to 12 cm. high, hairy or glabrous; heads 1.5 cm. high.

2. LEONTODON L. DANDELION.

Perennials with naked hollow stems, each bearing a single head; leaves lobed; flowers yellow; achenes slender-beaked; pappus of numerous soft bristles.

Achenes red or reddish . . . . . **1. L. laevigatum.**
Achenes greenish or greenish brown.
Outer bracts spreading or reflexed . . . . . **2. L. taraxacum.**
Outer bracts appressed.
Involucre 15 to 18 mm. high . . . . . **3. L. ceratophorum.**
Involucre 8 to 10 mm. high . . . . . **4. L. lyratum.**

1. Leontodon laevigatum Willd. REDSEED DANDELION. Dry slopes at Belton. Widely distributed in N. Amer.; naturalized from Eur. (*Taraxacum erythrospermum* Andrzej.; *T. laevigatum* DC.; *L. erythrospermum* Eichw.)—Leaves deeply lobed; the lobes triangular; stems 10 to 20 cm. high, slender; heads about 15 mm. high.

2. Leontodon taraxacum L. COMMON DANDELION. Frequent at low altitudes, especially on the west slope, on open hillsides or in waste ground. Native of Eur.; widely naturalized as a weed in N. Amer. (*Taraxacum taraxacum* Karst.)—Leaves 10 to 30 cm. long, usually with triangular lobes; stems 10 to 30 cm. high; heads 1.5 to 2 cm. high.

3. Leontodon ceratophorum Ledeb. ALPINE DANDELION. Occasional above timber line, on rock slides or rocky slopes; collected by Umbach on plains at east entrance. Alaska to N. Mex. (*Taraxacum montanum* Nutt.; *T. ceratophorum* DC.; *L. monticola* Rydb.)—Leaves 5 to 12 cm. long, toothed or lobed, glabrous; stems stout, 7 to 20 cm. high.

4. Leontodon lyratum Ledeb. Rock slide above Ptarmigan Lake. Alaska to Alta. and Colo. (*Taraxacum rupestre* Greene; *T. scopulorum* Rydb.; *T. lyratum* DC.; *L. rupestris* Rydb.; *L. scopulorum* Rydb.)—Leaves 3 to 8 cm. long, glabrous, with short triangular lobes; stems slender, 2 to 10 cm. high.

3. LACTUCA L. LETTUCE.

Plants annual, biennial, or perennial, with leafy stems; heads small, numerous, panicled, the flowers blue or yellow; achenes flattened, the pappus of numerous fine soft bristles.—Cultivated lettuce belongs to this genus.

Flowers yellow; leaves with fine spiny teeth. Achenes with a slender beak:
1. L. virosa.

Flowers blue; leaves without spiny teeth, often lobed.

Achenes with a slender beak; leaves pale green; heads 1.5 to 2 cm. high.
2. L. pulchella.

Achenes not beaked; leaves bright green on the upper surface; heads 1 cm. high.
3. L. spicata.

1. Lactuca virosa L. PRICKLY LETTUCE. A few plants in dry soil at Belton. Native of Eur.; introduced as a weed in N. Amer.—Biennial, 0.5 to 1.5 meters high, hairy below; leaves oblong or obovate, 10 to 30 cm. long, clasping; heads 10 to 12 mm. high; flowers pale yellow.

In many parts of the West this is a troublesome weed.

2. Lactuca pulchella (Pursh) DC. PRAIRIE LETTUCE. Rare on dry banks at east entrance; perhaps introduced. B. C. to Calif., N. Mex., and Sask.—Glabrous perennial, with rootstocks, 30 to 60 cm. high; leaves entire, toothed, or lobed; heads in a narrow panicle.

3. Lactuca spicata (Lam.) Hitchc. TALL LETTUCE. Frequent on the west slope at low and middle altitudes, in thin woods or on open or brushy hillsides. Idaho to Colo., N. C., and Newf.—Glabrous annual or biennial, 0.5 to 2 meters high, the stem unbranched except at the top; leaves deeply lobed, the lobes usually toothed, pale beneath; heads in a large panicle.

4. SONCHUS L.

1. Sonchus asper (L.) Hill. SOW THISTLE. Collected along railroad at Belton by Umbach. Native of Eur.; naturalized as a weed in N. Amer.—Glabrous annual, 30 to 60 cm. high; leaves clasping, deeply lobed, with spinelike teeth; heads about 12 mm. high; flowers yellow; achenes flat, ribbed, the pappus of soft white bristles.

5. PTILOCALAIS Greene.

1. Ptilocalais nutans (Geyer) Greene. Collected on bluffs at east entrance by Umbach; also at Columbia Falls by Williams, and probably to be found at Belton. B. C. to Calif., Colo., and Mont. (*Microseris nutans* A. Gray.)—Perennial, 20 to 50 cm. high, nearly glabrous; stems with few branches, sparsely leafy; leaves linear, entire, toothed, or with slender lobes; heads 10 to 15 mm. high, on long slender stalks; flowers yellow; pappus white, of hairy bristles, these dilated and scalelike at the base.

6. CREPIS L. HAWKSBEARD.

Low or tall perennials, usually with leafy stems; leaves entire, toothed, or lobed; heads small or large, few or numerous; flowers yellow; achenes with short or no beak; pappus of soft white bristles.

Leaves glabrous.

Plants 10 to 20 cm. high; achenes with a conspicuous beak . . . . . **1. C. elegans.**

Plants 3 to 8 cm. high, in small rounded tufts; achenes scarcely at all beaked.
2. C. nana.

Leaves hairy.

Bracts about 12, with gland-tipped hairs; leaves toothed or shallowly lobed.
3. C. runcinata.

Bracts about 7, woolly, without gland-tipped hairs; leaves deeply lobed.
4. C. intermedia.

1. Crepis elegans Hook. Occasional at low altitudes, on dry brushy slopes or dry flats or along stream beds; abundant at St. Mary. Yukon to Wyo. (*Youngia elegans* Rydb.)—Plants much branched, forming rounded clumps; lowest leaves oval to oblanceolate, 2 to 5 cm. long, entire, toothed, or lobed; heads about 8 mm. high; bracts about 8.

2. Crepis nana Richards. ALPINE HAWKSBEARD. Occasional above timber line, on the highest rock slides. B. C. to Utah, Alta., and Lab.; also in Asia. (*Youngia nana* Rydb.)—Plants nearly stemless; leaves long-stalked, rounded, 1 to 2 cm. long, entire or somewhat toothed, thick and succulent, pale, often purplish; heads 8 to 11 mm. long, often shorter than the leaves, with about 8 bracts.

The plants are half hidden by the stones among which they grow.

3. Crepis runcinata (James) Torr. & Gray. Low meadow at east entrance; one plant found in lawn at Many Glacier Hotel. Alta. to Colo. and N. Dak.—Leaves mostly basal, obovate or oblanceolate, 4 to 12 cm. long, usually coarsely toothed, hairy; stems 25 to 40 cm. high, slender, with few or no leaves; heads about 1 cm. high.

4. Crepis intermedia A. Gray. Dry hillsides at east entrance; scarce. B. C. to Calif., Colo., and Sask.—Plants 30 to 50 cm. high, stout, somewhat woolly; leaves 10 to 15 cm. long, the lobes often toothed; heads 12 to 14 mm. high, very narrow.

7. HIERACIUM L. HAWKWEED.

Low or tall, hairy perennials; leaves entire or toothed; heads large or small, usually several on each stem; flowers yellow or white.—In explanation of the name hawkweed, an early author makes the naive statement that the plant "is so called from hawks, as it is said, making use of the juice to clear the eyesight of their young ones; but which sort they use, there being many, botanists have not yet satisfied us."

Flowers white . . . . . **1. H. albiflorum.**
Flowers yellow.
  Plants without tufts of leaves at base of stem; stems very leafy; bracts unequal.
    Stems long-hairy near the base . . . . . **2. H. columbianum.**
    Stems glabrous or nearly so at the base . . . . . **3. H. scabriusculum.**
  Plants with tufts or rosettes of leaves at base of stem; stems with only a few leaves; bracts equal or nearly so.
    Leaves densely hairy; heads white-hairy . . . . . **4. H. scouleri.**
    Leaves glabrous or nearly so; heads black-hairy . . . . . **5. H. gracile.**

1. Hieracium albiflorum Hook. WHITE HAWKWEED. Frequent at low and middle altitudes, on open slopes or in woods or thickets. Yukon to Calif. and Colo.—Plants 30 to 80 cm. high, the stems slender, hairy, with few leaves; lowest leaves oblong or oblanceolate, thinly hairy; heads numerous, 8 to 10 mm. high, in a broad panicle.

2. Hieracium columbianum Rydb. Occasional at low altitudes, on open or brushy slopes. B. C. and Wash. to Mont.—Stems slender, 20 to 60 cm. high, purplish; stem leaves lanceolate, sessile, sharply toothed; heads few, 10 to 12 mm. high, glabrous or nearly so.

3. Hieracium scabriusculum Schwein. Occasional at low altitudes, on open slopes or in woods or thickets. B. C. to Oreg. and Wis.—Stems stout, 30 to 70 cm. high, purplish; stem leaves lanceolate or linear-lanceolate, most of them toothed, slightly short-hairy; heads few, 10 to 12 mm. high, broad.

It is doubtful whether this and *H. columbianum* are distinct species.

4. Hieracium scouleri Hook. Frequent on the east slope at low and middle altitudes, on open rocky hillsides. B. C. to Oreg., Utah, and Alta. (*H. albertinum* Farr.)—Plants 25 to 50 cm. high, often in clumps; leaves oblanceolate or linear-oblanceolate, 5 to 15 cm. long, entire, densely covered with long soft white hairs; heads few, 10 to 12 mm. high.

In most books the hairs are described as yellow, but on the growing plants they are white; they soon turn yellow in the herbarium. The plant is a handsome one, the contrast between the bright yellow flowers and the white hairs being very pleasing. The heads just before flowering are unusually attractive, their dense

covering of soft hairs reminding one of fur. In some of the Glacier Park specimens the heads are not very hairy, and these collections might be referred to *H. griseum* Rydb., which, however, is probably only a form of *H. scouleri*.

5. **Hieracium gracile** Hook. ALPINE HAWKWEED. Frequent above or near timber line, on rocky slopes and in meadows. Alaska to Calif., N. Mex., and Alta.—Stems usually 10 to 20 cm. high, short-hairy; leaves oblanceolate, 3 to 6 cm. long, long-stalked, entire or with few low teeth; heads usually few, 8 to 10 mm. high; flowers pale yellow.

Very luxuriant plants collected at Granite Park are nearly 40 cm. high and have numerous heads, the lower ones on very long slender stalks.

8. PRENANTHES Vaill.

1. **Prenanthes sagittata** (A. Gray) A. Nels. RATTLESNAKE-ROOT. Frequent at low and middle altitudes, usually in wet woods or thickets, frequently in swamps. Mont. and Idaho. (*Nabalus sagittatus* Rydb.)—Perennial, glabrous, 30 to 60 cm. high, with very leafy stems; leaves triangular or arrow-shaped, thin, toothed, stalked; heads about 12 mm. high, narrow, in a narrow panicle; flowers pure white; pappus of brownish bristles.

The flowers are rather handsome, but not very showy; they open late in the season.

86. ASTERACEAE. Aster Family.

Herbs or rarely shrubs; leaves alternate or opposite, simple or compound; flowers in heads, clustered on a receptacle, the head surrounded by an *involucre* of *bracts; disk flowers* (the inner flowers of the head) with a small tubular 5-lobed corolla: outer flowers of the head often with a narrow strap-shaped corolla (*ray*); fruit an achene, usually bearing at the summit *pappus*, this representing the calyx and composed of scales, bristles, or awns.—The largest family of plants. The name Compositae is frequently applied to this and the Cichoriaceae, which are often united as a single family.

A. Flower heads without rays.
  Leaves with spine-tipped teeth . . . . . **27. CIRSIUM.**
  Leaves never with spine-tipped teeth.
    Leaves deeply lobed.
      Flower head one on each stem; pappus of bristles . . . . . **8. ERIGERON.**
      Flower heads several or many; pappus not of bristles.
        Heads 7 to 10 mm. broad; plants annual . . . . . **21. MATRICARIA.**
        Heads 5 mm. broad or less.
          Bracts distinct; pappus of bristles; leaves alternate . . **23. ARTEMISIA.**
          Bracts partly united; pappus none; leaves opposite . . . **14. AMBROSIA.**
    Leaves entire or toothed.
      Leaves not white-hairy.
        Leaves linear or nearly so.
          Plants covered with sticky hairs, ill-scented . . . . . **17. MADIA.**
          Plants without sticky hairs, not ill-scented . . . . . **8. ERIGERON.**
        Leaves lanceolate to triangular or broader.
          Bracts 5; heads about 4 mm. high . . . . . **13. IVA.**
          Bracts 10 or more; heads much larger.
            Bracts very obtuse; pappus brownish red; leaves alternate. **4. PYRROCOMA.**
            Bracts acute; pappus white or yellowish.
              Plants nearly glabrous; heads short-stalked; bracts very unequal in length . . . . . **1. COLEOSANTHUS.**
              Plants hairy; heads long-stalked; bracts about equal in length. **25. ARNICA.**

Leaves densely covered with close matted white hairs on one or both surfaces.
Flowering branches densely covered with very sticky hairs; bracts 4 or 5. **12. ADENOCAULON.**
Flowering branches without sticky hairs, or with a few but these hidden under the other hairs and the stems not sticky to the touch; bracts numerous.
Leaves triangular, 10 to 20 cm. wide or larger . . . . . **24. PETASITES.**
Leaves not triangular, much less than 10 cm. wide.
Pappus none; leaves, at least some of them, toothed; heads mostly 2 to 3 mm. broad . . . . . **23. ARTEMISIA.**
Pappus of numerous soft bristles; leaves all entire; heads mostly more than 3 mm. broad.
Plants not dioecious, the pistillate and staminate flowers in the same heads; plants usually branched, annual or perennial; heads in dense clusters . . . . . **11. GNAPHALIUM.**
Plants dioecious, the pistillate and staminate flowers on separate plants; plants with unbranched flowering stems, perennial; flowers mostly in racemes or loose clusters.
Plants usually with clusters of leaves at the base, often with runners; leaves broad or narrow; pappus bristles of the pistillate flowers falling off in a ring . . . . . **9. ANTENNARIA.**
Plants without clusters of basal leaves or runners; leaves linear or linear-lanceolate; pappus bristles falling off separately. **10. ANAPHALIS.**

AA. Flower heads with rays.
Rays not yellow, mostly white, blue, or purple.
Leaves triangular, 10 to 20 cm. wide or larger . . . . . **24. PETASITES.**
Leaves not triangular, much less than 20 cm. wide.
Leaves divided into numerous narrow lobes.
Flower stems naked; leaves palmately lobed; plants not strong-scented. **8. ERIGERON.**
Flower stems leafy; leaves pinnately lobed; plants strong-scented. **20. ACHILLEA.**
Leaves entire or toothed or with only a few lobes.
Pappus none; plants glabrous; rays white . . . **22. CHRYSANTHEMUM.**
Pappus of bristles or awns; plants glabrous or usually hairy; rays of various colors.
Heads 3 to 4 mm. broad; rays very short and inconspicuous; plants annual . . . . . **8. ERIGERON.**
Heads mostly 5 mm. broad or larger; rays long and conspicuous; plants nearly all perennial.
Pappus of a few awns; stems each with a single head; bracts broad, with thin whitish margins . . . . . **6. TOWNSENDIA.**
Pappus of numerous soft bristles; heads 1 to many; bracts never with thin whitish margins.
Bracts mostly linear-oblong or broader; heads usually numerous. **7. ASTER.**
Bracts very narrowly linear; heads often solitary on the stem. **8. ERIGERON.**

Rays bright yellow.
Flower heads very sticky, with gland-tipped hairs or with a resinous secretion; leaves alternate.
Leaves toothed; plants perennial; rays large and showy. . . **2. GRINDELIA.**
Leaves entire; plants annual; rays very small and inconspicuous. **17. MADIA.**

Flower heads not very sticky or, if somewhat so, the leaves opposite.
Pappus none or of 2 awns or scales or of chafflike scales.
Leaves arrow-shaped or triangular, covered with matted white hairs on both sides; flower stems leafless or nearly so . . . . **15. BALSAMORRHIZA.**
Leaves never arrow-shaped or triangular, green; stems leafy.
Leaves entire or toothed; rays not lobed . . . . . **16. HELIANTHUS.**
Leaves, at least some of them, lobed; rays 3-lobed at the apex.
Leaves with broad lobes, or most of the leaves only toothed; bracts not in 2 series; rays 1.5 to 3 cm. long . . . . . **19. GAILLARDIA.**
Leaves with linear lobes; bracts in 2 series; rays less than 1 cm. long. **18. HYMENOXYS.**
Pappus of numerous bristles.
Leaves all or mostly opposite . . . . . **25. ARNICA.**
Leaves alternate.
Bracts in one series and about equal in length, a few short ones sometimes present at the base of the head; plants usually succulent. **26. SENECIO.**
Bracts in several series, very unequal, overlapping; plants not succulent.
Heads numerous on each stem, small, rarely more than 5 mm. broad. **5. SOLIDAGO.**
Heads 1 or few on each stem, large, usually more than 1 cm. broad.
Leaves entire; plants long-hairy; leaves thin . . . **3. CHRYSOPSIS.**
Leaves toothed; plants glabrous or very finely hairy; leaves thick and stiff . . . . . **4. PYRROCOMA.**

1. COLEOSANTHUS Cass.

1. Coleosanthus grandiflorus (Hook.) Kuntze. Dry cliffs on Altyn Peak and along Appekunny Creek; rock slides below Sperry Chalets; scarce. Wash. and Oreg. to Alta. and N. Mex. (*Brickellia grandiflora* Ell.)—Perennial herb, 30 to 60 cm. high, slightly hairy; leaves mostly opposite, triangular, stalked, with rounded teeth; heads 12 to 15 mm. high, in a small dense cluster; flowers pale dull yellow; pappus of numerous bristles.

2. GRINDELIA Willd.

1. Grindelia perennis A. Nels. GUM-PLANT. Occasional on the east slope at low altitudes, on open hillsides or prairie, often about dried-up ponds. Alta. and Sask. to Colo.—Perennial, 15 to 40 cm. high, often forming dense clumps, glabrous or nearly so; leaves alternate, oblanceolate or oblong, 2 to 7 cm. long, thick, toothed; heads few or numerous, 1 cm. high, very gummy, with long yellow rays; pappus of a few coarse bristles, soon falling from the achenes.

Easily recognized by the sticky heads. An extract of some species of *Grindelia* is employed as a remedy for the effects of poison ivy. The bright yellow heads are conspicuous on the prairie.

3. CHRYSOPSIS Nutt.

1. Chrysopsis villosa (Pursh) Nutt. GOLDEN ASTER. Common at low and middle altitudes, usually on open slopes, occasionally found near or above timber line. Idaho to Minn., Tex., and N. Mex.—Perennial, 15 to 40 cm. high, usually forming dense clumps, short-hairy; leaves alternate, entire, 1.5 to 4 cm. long, obovate or oblanceolate, finely hairy; heads few or numerous, about 1 cm. high, stalked; rays bright yellow; pappus of yellowish white bristles.

A rather showy but unattractive plant.

4. PYRROCOMA Nutt.

Perennials with thick taproots; leaves alternate, usually with sharp teeth, thick; heads 1 or few on each stem, with conspicuous or very small rays; bracts broad, overlapping; flowers yellow; pappus of yellowish or brownish bristles.

Rays showy; leaves glabrous; heads about 1 cm. high . . . . . **1. P. lanceolata.**
Rays hidden by the pappus; leaves finely hairy, at least at first; heads 1.5 to 5 cm. high, **2. P. erythropappa.**

1. Pyrrocoma lanceolata (Hook.) Greene. Frequent about dried-up ponds on prairie at east entrance. B. C. to Wyo. and Nebr.—Stems numerous, 10 to 20 cm. high, glabrous or nearly so; basal leaves oblanceolate, 5 to 10 cm. long, somewhat toothed; bracts 1.5 to 2 mm. wide.

2. Pyrrocoma erythropappa Rydb. Dry open slopes at east entrance. Idaho and Mont.—Stems few, stout, 15 to 30 cm. high.; basal leaves oblanceolate or obovate, usually entire, very thick; bracts 3 to 5 mm. wide, with a narrow thin border.

5. SOLIDAGO L. Goldenrod.

Low or tall perennials with rootstocks; leaves alternate, entire or toothed; heads small, panicled, with short rays; flowers yellow; pappus of slender whitish bristles.

Stem leaves, at least most of them, sharply toothed; leaves mostly lanceolate.
  Leaves lanceolate, mostly 13 to 25 mm. wide; panicle usually broad and with long branches . . . . . **1. S. serotina.**
  Leaves narrowly lanceolate or linear-lanceolate, mostly 5 to 12 mm. wide; panicle narrow, with short branches . . . . . **2. S. elongata.**
Stem leaves all or mostly entire, sometimes with low rounded teeth; leaves mostly oblanceolate.
  Leaves very hairy on the stalks or on the margins near the base; plants of alpine or wet situations . . . . . **3. S. ciliosa.**
  Leaves not hairy on the margins near the base, or very inconspicuously so; plants of low dry situations.
    Heads 6 to 7 mm. high . . . . . **4. S. concinna.**
    Heads 5 mm. high or less . . . . . **5. S. missouriensis.**

1. Solidago serotina Ait. Frequent at low altitudes, in low thickets or on open or brushy slopes, sometimes in woods; on the west slope occasionally found also at middle altitudes. B. C. to Colo., Ga., and Newf.—Stems stout, 0.5 to 1 meter high, usually glabrous or nearly so, often tinged with red or purple; leaves 5 to 15 cm. long, sessile, nearly glabrous but somewhat roughened on the veins beneath; heads about 5 mm. high.

Some of the specimens referred here have nearly as small panicles as *S. elongata*, but this is doubtless due to the fact that they grew in dry places.

2. Solidago elongata Nutt. Frequent at low altitudes, in bogs, low thickets, or deep woods, sometimes on open hillsides. B. C. to Calif., Nev., and Mont.—Stems slender, 0.5 to 1 meter high, glabrous or nearly so, very leafy; leaves 5 to 10 cm. long, slightly roughened; heads about 5 mm. high.

3. Solidago ciliosa Greene. Alpine goldenrod. Common above timber line, in meadows or on rock slides; occasional at middle or even low elevations, on open slopes or in woods or bogs. B. C. and Alta. to N. Mex. and Ariz.—Plants 5 to 30 cm. high, the stems stout, glabrous below; lowest leaves oblanceolate, shallowly toothed, glabrous, 2 to 7 cm. long, stalked; panicle narrow, usually dense; heads 5 to 7 mm. high, the bracts acute.

4. Solidago concinna A. Nels. Frequent on the east slope at low altitudes, on dry open hillsides, in aspen woods, or rarely on stream banks. B. C. and Alta. to Colo.—Stems stout, 20 to 50 cm. high, glabrous or nearly so; lowest leaves stalked, oblanceolate, 6 to 15 cm. long, entire or somewhat toothed, thick; bracts mostly acute.

5. Solidago missouriensis Nutt. Frequent on the east slope at low altitudes, on dry, brushy or open hillsides. B. C. to Oreg., Colo., and S. Dak.—Stems stout, 15 to 40 cm. high, glabrous; lowest leaves oblanceolate, 5 to 10 cm. long, glabrous, entire or slightly toothed; bracts mostly obtuse.

6. TOWNSENDIA Hook.

1. Townsendia parryi D. C. Eaton. Occasional on the east slope at low altitudes, on dry hills, shale banks, or prairie. Alta. to Idaho and Wyo.—Biennial, 10 to 20 cm. high; stem with appressed hairs, bearing a single head, leafy; leaves at base of stem spatulate, glabrous on the upper surface; head large, the rays 12 to 15 mm. long, purplish pink; pappus of long bristles.

The plants bloom early in the season.

7. ASTER L. Aster.

Perennials with rootstocks; leaves alternate, toothed or entire; heads few or many, mostly in panicles or corymbs, with purple to white rays; pappus of numerous whitish bristles.

Involucres and peduncles with viscid glands.
- Stem leaves ovate or obovate, very rough, coarsely toothed . . **2. A. conspicuus.**
- Stem leaves linear, lanceolate, or oblong, not rough, mostly entire.
  - Leaves lanceolate or oblong, mostly 1 to 3 cm. wide; involucre 1 cm. long. **3. A. sayianus.**
  - Leaves linear or linear-oblong, less than 1 cm. wide; involucre 6 to 7 mm. long. **4. A. campestris.**

Involucres and peduncles without glands.
- Bracts hairy (sometimes only minutely hairy) on the back.
  - Bracts not bristle-tipped; rays pink to purple.
    - Heads 1.5 cm. high; rays pink; stems glabrous or nearly so. **1. A. engelmannii.**
    - Heads 1 cm. high or less; rays mostly purple; stems hairy.
      - Stem leaves oblanceolate or obovate, narrowed at the base; heads 1 or few. **5. A. meritus.**
      - Stem leaves linear or narrowly oblong, clasping; heads numerous. **6. A. nelsonii.**
  - Bracts tipped with a short bristle; rays white.
    - Pubescence of the stems of appressed hairs . . . . . **7. A. polycephalus.**
    - Pubescence of the stems of loose spreading hairs.
      - Heads about 5 mm. high . . . . . **8. A. exiguus.**
      - Heads 6 to 9 mm. high . . . . . **9. A. crassulus.**
- Bracts glabrous on the back, the margins sometimes hairy.
  - Plants glabrous throughout . . . . . **10. A. laevis.**
  - Plants hairy, at least on the upper part of the stem.
    - Outer bracts much shorter than the inner ones, never leaflike.
      - Heads about 1 cm. broad; stem leaves linear-lanceolate. **11. A. occidentalis.**
      - Heads about 1.5 cm. wide; stem leaves lanceolate or oblong. **12. A. fremontii.**
    - Outer bracts mostly as long as the inner ones or longer, often leaflike.
      - Heads numerous, 6 to 8 mm. high; outer bracts often reflexed. **13. A. oreganus.**
      - Heads few, 10 mm. high or more; outer bracts not reflexed. **14. A. frondeus.**

1. Aster engelmannii D. C. Eaton. Pink aster. Frequent, especially on the east slope, at low and middle altitudes, in low thickets or in woods; often found near or just above timber line. B. C. and Wash. to Nev., Colo., and Alta. (*Eucephalus*

engelmannii Greene.)—Stems stout, unbranched, 0.5 to 1 meter high, usually glabrous, very leafy; leaves mostly ovate, 5 to 10 cm. long, sessile, entire; heads few, in a corymb, the bracts pale, often purplish; rays few, pink or rarely lavender.

The rays are not nearly so numerous as in our other species, and they are rather widely spaced.

2. Aster conspicuus Lindl. ROUGH ASTER. PLATE 52, A. Common at low and middle altitudes, in thickets or thin woods, sometimes on open slopes. B. C. to Oreg., Wyo., and S. Dak.—Stems 30 to 60 cm. high, glabrous or rough, very leafy; leaves 7 to 15 cm. long, obtuse or acute, thick, sessile; heads few or numerous, 10 to 13 mm. high; rays pale purple.

3. Aster sayianus Nutt. Common at low and middle altitudes, in bogs, wet thickets, or moist woods, sometimes among aspens or on open slopes. B. C. to Oreg., Mont., and Alta.—Stems slender, 30 to 80 cm. high, hairy, usually purplish, very leafy; leaves thin, 4 to 8 cm. long, entire or slightly toothed, sessile; heads few, in a leafy cluster; rays usually deep purple, sometimes pale purple.

4. Aster campestris Nutt. Occasional on the east slope at low altitudes, on dry open hillsides or low flats. B. C. to Oreg., Colo., and Alta.—Stems 20 to 40 cm. high, stiff and brittle, rough-hairy; leaves sessile, 2 to 4 cm. long; heads few or numerous; rays bright purple.

The plant blooms at the end of summer.

5. Aster meritus A. Nels. Abundant above timber line on rock slides and open slopes; occasional at middle or even low altitudes, on flats or open rocky slopes. B. C. to Wyo. and S. Dak.—Plants 5 to 20 cm. high, often prostrate, usually forming loose mats, the stems purplish, hairy; leaves 2 to 7 cm. long, finely hairy, entire or toothed, sessile, obtuse or acute; rays purple to lavender.

A showy plant, often conspicuous, especially on rock slides, forming great mats over the ground. It is abundant in sand along the river at Belton, but it is typically an alpine species.

6. Aster nelsonii Greene. Frequent on the east slope at low altitudes, on open hillsides or rocky flats or in low thickets. Wash. and Oreg. to Mont. and Colo.—Plants stout, 20 to 50 cm. high, the stems with mostly appressed hairs; leaves 4 to 7 cm. long, rough, thick; heads about 8 mm. high; rays pale purple.

7. Aster polycephalus Rydb. Prairie at east entrance. Alta. to Ariz., Tex., and Nebr.—Stems 20 to 50 cm. high; leaves linear, 2 to 5 cm. long, rough-hairy; heads 6 to 8 mm. high; rays 4 to 5 mm. long.

8. Aster exiguus (Fernald) Rydb. Occasional at low altitudes, on open slopes. Wash. to Tex., Pa., and Vt.—Plants 10 to 40 cm. high, often branched, very leafy; leaves linear or oblong, 1 to 3 cm. long, finely hairy, sessile; rays 3 to 4 mm. long.

9. Aster crassulus Rydb. Dry banks at east entrance. Sask. to Calif., Colo., and N. Dak.—Plants branched, 25 to 50 cm. high; leaves linear or linear-oblong, 2 to 5 cm. long, sessile, finely hairy; heads numerous, the bracts broad, with spreading tips; rays 4 to 6 mm. long.

10. Aster laevis L. Common at low and sometimes at middle altitudes, on brushy slopes, in woods, or on flats. B. C. to N. Mex., La., and Ont.—Plants pale green, 30 to 60 cm. high; leaves ovate or lanceolate, entire or toothed, the lower ones long-stalked; heads few or numerous, 8 to 9 mm. high, the bracts very unequal, closely appressed; rays pale blue or purple.

A showy plant, abundant along the automobile road on the east side of the park, often forming large dense patches.

11. Aster occidentalis Nutt. Belton, in sandy thickets. Yukon to Calif. and Colo.—Plants 20 to 60 cm. high, nearly glabrous; leaves entire or toothed, bright green; heads numerous; rays pale purple.

12. Aster fremontii (Torr. & Gray) A. Gray. Low thickets at east entrance. B. C. and Alta. to Colo. and Utah. (*A. umbachii* Rydb.)—Plants stout, 20 to 60 cm. high, nearly glabrous, very leafy; leaves 3 to 10 cm. long, entire; heads few or numerous; rays purple, 7 to 10 mm. long.

13. Aster oreganus Nutt. Frequent at low altitudes, in swamps or bogs or in low thickets. B. C. to Nev. and Mont.—Stems slender, 20 to 70 cm. high, nearly glabrous; leaves linear-lanceolate, 3 to 8 cm. long, sessile, bright green, entire; panicles very leafy; rays lavender or pinkish.

14. Aster frondeus (A. Gray) Greene. Common nearly everywhere, in woods or thickets or on open slopes; frequent above timber line. B. C. and Alta. to Colo.—Plants 15 to 90 cm. high, nearly glabrous; leaves mostly oblanceolate, 5 to 15 cm. long, entire; rays purple.

The commonest aster of the park, flowering nearly throughout the summer. The plants are somewhat variable and many of the forms have been separated as species. Those growing above timber line are usually only 10 to 20 cm. high; this form is *A. apricus* (A. Gray) Rydb., but it differs from *A. frondeus* only in size.

8. ERIGERON L. Fleabane.

Perennials or occasionally annuals; leaves alternate, sometimes all at the base of the stem, entire, toothed, or lobed; heads small or large, usually with showy rays, these white, pink, or purple; pappus of slender bristles.

Rays inconspicuous, erect or nearly so, usually inrolled from the sides; leaves entire
  Heads only 3 to 4 mm. broad; lower leaves often toothed . . . . **1. E. canadensis.**
  Heads 7 to 12 mm. broad; leaves entire.
    Heads many on each stem; plants mostly 20 to 40 cm. high . . . . . **2. E. acris.**
    Heads usually 1 or 2 on each stem; plants mostly 5 to 15 cm. high.
      Heads not black-hairy . . . . . **3. E. jucundus.**
      Heads densely black-hairy . . . . . **4. E. unalaschkensis.**
Rays conspicuous, long and spreading; in one species the rays sometimes wanting, but the leaves deeply lobed.
  Leaves divided into linear lobes . . . . . **5. E. compositus.**
Leaves entire or toothed.
  Stems low, usually less than 15 cm. high, each with a single head.
    Rays white . . . . . **6. E. caespitosus.**
    Rays pink or purple.
      Bracts densely woolly with soft hairs.
        Lowest leaves very hairy, often 3-toothed . . . . . **7. E. lanatus.**
        Lowest leaves glabrous or nearly so, entire . . . . . **8. E. uniflorus.**
      Bracts glabrous or with glands or with short stiff hairs.
        Leaves glabrous or nearly so; bracts not hairy . . . . . **9. E. leiomerus.**
        Leaves hairy; bracts short-hairy . . . . . **10. E. nanus.**
  Stems tall, usually 20 to 60 cm. high or more, sometimes low but each stem then with 2 or more heads.
    Rays white or pink.
      Stems with fine, closely appressed hairs . . . . . **11. E. ramosus.**
      Stems with short or long spreading hairs.
        Heads about 1.5 cm. broad; bracts with long loose hairs . . . **13. E. asper.**
        Heads 1 cm. broad or less; bracts with short, often close hairs.
          Leaves entire; plants in clumps, less than 20 cm. high. **6. E. caespitosus.**
          Leaves mostly with low teeth; plants not in clumps, usually 30 to 50 cm. high . . . . . **12. E. philadelphicus.**

Rays purple.
Tips of the bracts loose and spreading; heads nearly always one on each stem. **14. E. salsuginosus.**
Tips of the bracts appressed; heads usually several on each stem.
Leaves very hairy . . . . . **15. E. conspicuus.**
Leaves glabrous except on the margins and sometimes on the main veins.
Bracts with long spreading hairs . . . . . **16. E. speciosus.**
Bracts minutely hairy and glandular . . . . . **17. E. macranthus.**

1. **Erigeron canadensis** L. HORSEWEED. Occasional in waste or cultivated ground at Belton and about the head of Lake McDonald. Widely distributed in N. Amer. (*Leptilon canadense* Britton.)—Annual, 30 to 100 cm. high, very hairy; leaves linear or oblanceolate, 2 to 10 cm. long; heads very numerous, in a long narrow panicle; flowers white.

2. **Erigeron acris** L. Rather rare, at low altitudes, in thin woods or on brushy slopes. Alaska to B. C., Colo., Me., and Lab.; also in Eur. and Asia. (*E. droebachensis* Muell.; *E. yellowstonensis* A. Nels.)—Biennial or perennial, with hairy or nearly glabrous stems; leaves entire, the lowest ones spatulate or oblanceolate, 5 to 10 cm. long; heads 6 to 8 mm. high, with very short rays.

A somewhat variable plant, several forms of which are treated by some authors as separate species. The flower heads are inconspicuous.

3. **Erigeron jucundus** Greene. Frequent above timber line, in meadows or on rock slides or exposed summits; sometimes found on cliffs or open slopes at middle altitudes. B. C. to Colo. and Que.—Stems finely hairy, often clustered; lowest leaves spatulate, entire, hairy; heads about 6 mm. high, the bracts often purplish; rays very short, pink.

4. **Erigeron unalaschkensis** (DC.) Rydb. Rocky slopes at Swiftcurrent Pass. Alaska to Mont., Lab., and Greenl.—Perennial, hairy; leaves 1 to 3 cm. long, spatulate; heads solitary, 8 to 10 cm. high, the bracts purplish; rays white.

5. **Erigeron compositus** Pursh. CUTLEAF FLEABANE. Frequent above timber line, on rock slides and exposed summits; occasional at middle and low altitudes, on exposed slopes. Alaska to Calif., Colo., Sask., and Greenl.—Plants perennial, often in dense tufts; stems naked or with a few linear entire leaves, bearing a single head; basal leaves 1 to 4 cm. long, 1 or 2 times divided, hairy or glabrous; heads about 7 mm. high; rays white or pink, sometimes none.

The glabrous form is *E. compositus nudus* Rydb. Plants with and without rays often grow side by side.

6. **Erigeron caespitosus** Nutt. WHITE FLEABANE. Frequent on the east slope at low altitudes, on dry rocky hillsides or flats. Yukon to Utah and Colo.—Plants 10 to 15 cm. high, densely tufted, finely hairy; leaves oblanceolate, 4 to 10 cm. long, entire; obtuse, 3-nerved; heads 6 to 7 mm. high; rays white, 6 to 10 mm. long.

7. **Erigeron lanatus** Hook. Open rocky slopes at Piegan Pass. B. C., Alta., and Mont.—Perennial, loosely tufted, hairy; heads 10 to 12 mm. high, densely white-woolly; rays pale purplish.

8. **Erigeron uniflorus** L. Frequent above timber line on rocky slopes or exposed summits. Alaska to Calif., Colo., and Mont.; also in Eur. (*E. simplex* Greene.)—Plants perennial, 5 to 10 cm. high, hairy; lowest leaves spatulate or oblanceolate, 2 to 4 cm. long; heads 8 to 10 mm. high, white-woolly; rays pink.

9. **Erigeron leiomerus** A. Gray. Moist rocky slopes at Sexton Glacier and Piegan Pass. Alta. to Utah and N. Mex.—Basal leaves spatulate, 2 to 5 cm. long, obtuse; heads 5 to 7 mm. high, the bracts purplish; rays pale purple.

10. **Erigeron nanus** Nutt. Moist open slopes at Morning Eagle Falls; rare. Mont. to Colo. and Utah. (*E. poliospermus* A. Gray.)—Lower leaves linear-oblanceolate, 3 to 5 cm. long, obtuse; heads 5 to 7 mm. high; rays pink or white.

11. Erigeron ramosus (Walt.) B. S. P. Daisy fleabane. Occasional on dry brushy slopes or in waste ground at Belton. B. C. to N. S. and Fla.—Annual, 30 to 70 cm. high, branched, with slender stems; stem leaves linear, entire; heads numerous, 3 to 4 mm. high, with numerous white rays about 5 mm. long.

Probably introduced here; a common weed in the eastern States.

12. Erigeron philadelphicus L. Sandbar along creek at east entrance; only one plant found. B. C. to Calif., Fla., and Lab.—Biennial, the stems slightly branched above; lowest leaves oblanceolate, short-stalked; stem leaves clasping; heads 4 to 5 mm. high; rays pinkish, very numerous, 5 to 6 mm. long.

13. Erigeron asper Nutt. Collected on hillsides at east entrance by Umbach. Mont. and Alta. to N. Dak.—Stems 20 to 50 cm. high, very hairy; lower leaves linear-oblanceolate, 3 to 10 cm. long, entire or somewhat toothed, hairy; heads 1 to 4, 5 to 7 mm. high; rays white or pink.

14. Erigeron salsuginosus (Richards.) A. Gray. Showy fleabane. Plate 52, B. Abundant above and just below timber line, in moist meadows or on rock slides; sometimes found in moist places at middle altitudes, occasionally in woods. Alaska to Calif., N. Mex., and Sask.—Stems 15 to 50 cm. high; lowest leaves oval, obovate, or spatulate, 5 to 10 cm. long, glabrous or nearly so; heads about 1 cm. high, 1.5 to 2 cm. broad; rays broad, purple or pale purple.

Our showiest species of *Erigeron*, often the most conspicuous and abundant plant of high meadows.

15. Erigeron conspicuus Rydb. Occasional at low altitudes on the east slope, on open hillsides or in meadows. Wash. to Mont. and Colo.—Stems clustered, 25 to 50 cm. high, very hairy, densely leafy; stem leaves lanceolate, sessile, entire; heads 8 mm. high, 1.5 to 2 cm. broad; rays narrow, purple.

16. Erigeron speciosus DC. Frequent on the east slope at low altitudes, among aspens, on open hillsides, or in low thickets. B. C. and Alta. to Colo. and Oreg.—Stems clustered, 30 to 50 cm. high, glabrous or nearly so, very leafy; stem leaves oblong or lanceolate, entire; heads 7 to 8 mm. high; rays narrow, purple.

17. Erigeron macranthus Nutt. Frequent on the east slope at low and middle altitudes, on open hillsides, in aspen woods, or along streams. B. C. to Oreg., N. Mex., and Alta.—Stems clustered, 20 to 50 cm. high, glabrous or nearly so; stem leaves ovate to linear-lanceolate, entire; heads 7 to 8 mm. high; rays narrow, bluish purple.

This and the last two preceding species are similar in general appearance. They are showy plants but seldom occur in abundance.

9. ANTENNARIA Gaertn. Pussytoes.

Perennials, usually densely woolly, often with long or short runners; leaves alternate, entire, usually forming rosettes; heads without ray flowers, in corymbs or racemes, the pistillate and staminate flowers on separate plants; achenes with copious pappus of white bristles.—The species are difficult to separate, and the validity of many of them is uncertain.

Plants with erect stolons or with none.

Heads 4 to 5 mm. high; bracts nearly glabrous, scarious throughout. **1. A. luzuloides.**

Heads 6 to 10 mm. high; bracts very woolly below, only the tips scarious.

Bracts with a large dark spot; bracts of pistillate heads acute; plants 10 to 20 cm. high . . . . . **2. A. lanata.**

Bracts with small or no dark spot; bracts of pistillate heads obtuse; plants usually 30 to 40 cm. high . . . . . **3. A. anaphaloides.**

Plants with prostrate runners.
Heads on long slender stalks, in loose racemes; bracts nearly glabrous; leaves glabrous on the upper surface . . . . . **4. A. racemosa.**
Heads usually short-stalked, in corymbs; bracts woolly at the base; leaves glabrous or usually woolly.
Upper portion of the bracts pink, white, or yellowish white.
Leaves glabrous on the upper surface . . . . . **5. A. howellii.**
Leaves woolly on the upper surface.
Bracts with pink tips . . . . . **6. A. rosea.**
Bracts with white or yellowish white tips.
Leaves of the runners loose, narrowly oblanceolate; bracts with dark spots . . . . . **7. A. corymbosa.**
Leaves of the runners dense, spatulate; bracts without dark spots.
Bracts of the pistillate heads obtuse . . . . . **8. A. arida**
Bracts of the pistillate heads (at least the inner ones) acute.
9. A. microphylla.
Upper portion of the bracts blackish, dark green, or pale or dark brown.
Leaves becoming glabrous and green . . . . . **10. A. chlorantha.**
Leaves very woolly on both sides.
Leaves of the runners broadly obovate-wedge-shaped, nearly sessile.
11. A. pulvinata.
Leaves of the runners spatulate or oblanceolate, narrowed into distinct petioles.
Bracts very dark, nearly black . . . . . **12. A. media.**
Bracts brown or pale brown.
Pubescence of the leaves of closely appressed yellowish hairs.
13. A. flavescens.
Pubescence of the leaves of rather loose white hairs.
Bracts of the pistillate heads acute or acutish . . . **14. A. oxyphylla.**
Bracts of the pistillate heads obtuse.
Involucres somewhat viscid; bracts with pale tips.
15. A. sedoides.
Involucres not viscid; bracts with brown tips . . **16. A. umbrinella.**

1. **Antennaria luzuloides** Torr. & Gray. Frequent on open, rocky, or brushy slopes at middle altitudes, or sometimes above timber line. B. C. to Oreg., Wyo., and Mont.—Plants slender, 20 to 40 cm. high; leaves linear-oblanceolate, 3 to 8 cm. long, acute or obtuse, silky-woolly, usually with conspicuous nerves; heads numerous, pale brown. Plants often deformed by galls.

2. **Antennaria lanata** (Hook.) Greene. Rare on open rocky slopes about Gunsight Pass. B. C. to Oreg., Mont., and Alta.—Plants densely and loosely white-woolly; leaves narrowly oblanceolate, 3 to 8 cm. long; heads few, densely clustered; bracts with pale tips.

3. **Antennaria anaphaloides** Rydb. Occasional on dry hillsides at low altitudes. B. C. to Oreg., Colo., and Mont.—Plants densely silky-woolly; leaves narrowly oblanceolate, 8 to 15 cm. long, acute, conspicuously nerved; heads numerous, in a dense corymb, the bracts with white tips.

4. **Antennaria racemosa** Hook. Frequent in meadows above timber line; sometimes on open grassy slopes at lower levels. B. C. to Calif., Wyo., and Alta.—Plants 15 to 40 cm. high, with long runners; leaves oval or spatulate, 3 to 6 cm. long, obtuse, stalked, bright green on the upper surface, woolly beneath; heads few, 6 to 8 mm. high, the bracts greenish, acute.

5. **Antennaria howellii** Greene. Meadow among aspens at east entrance; the species has been collected at Columbia Falls and so is probably to be found about Belton.

B. C. and Wash. to Mont. and Alta.—Plants matted, 15 to 30 cm. high; leaves oblanceolate or obovate, 2 to 5 cm. long, obtuse or acutish, closely white-woolly beneath; heads 8 to 10 mm. high, the bracts very acute.

6. Antennaria rosea (D. C. Eaton) Greene. Frequent at low altitudes, in gravelly meadows, on open rocky slopes, in aspen woods, or in low thickets. Yukon to Calif., Colo., and S. Dak.—Plants slender, 15 to 40 cm. high, loosely woolly; leaves oblanceolate 1.5 to 3 cm. long, obtuse or acute; heads few, about 5 mm. high, loosely or densely clustered, the bracts obtuse, with pale or deep pink tips.

The form with deep pink bracts is a handsome plant.

7. Antennaria corymbosa E. Nels. Meadows about the east entrance, *Umbach*. Oreg. to Mont. and Colo.—Plants slender, 20 to 30 cm. high; basal leaves 1.5 to 3 cm. long, acute; heads few, 4 to 5 mm. high; bracts of the pistillate heads obtuse.

8. Antennaria arida E. Nels. Gravelly meadows below Lake McDermott, and dry rocky slopes of Altyn Peak. Idaho and Mont. to N. Mex. and Utah.—Plants 10 to 15 cm. high; leaves spatulate, 1 to 1.5 cm. long, obtuse, closely woolly; heads 6 to 8 mm. high.

9. Antennaria microphylla Rydb. Low meadow at St. Mary, abundant; dry gravel bank at Belton, frequent. Yukon to Nebr. and N. Mex.—Plants slender, 15 to 30 cm. high; leaves oblanceolate, obtuse or acutish, with closely appressed pubescence; heads few, densely clustered, 5 to 6 mm. high.

10. Antennaria chlorantha Greene. Meadows about Iceberg Lake and Grinnell Glacier. B. C. and Mont.—Plants 5 to 15 cm. high; leaves oblanceolate, 1.5 to 2.5 cm. long, acutish, at first loosely woolly but becoming glabrous and green; heads densely clustered, 5 to 7 mm. high, the bracts dark green.

11. Antennaria pulvinata Greene. Frequent above timber line, on open rocky slopes or in moist meadows. Alta., B. C., and Mont.—Plants matted, 5 to 10 cm. high; leaves 1 to 1.5 cm. long, rounded at the apex, loosely woolly; heads few, densely clustered, the bracts dark green.

12. Antennaria media Greene. Common above timber line, in meadows or on moist rocky slopes. B. C. to Calif., Colo., and Alta.—Plants matted, 5 to 12 cm. high; leaves obtuse, 1 to 2 cm. long, loosely woolly; heads few, densely clustered; inner bracts of the pistillate heads acute.

13. Antennaria flavescens Rydb. Collected on Mount Henry by Umbach. Wash. to Mont. and Colo.—Plants matted, 10 cm. high; leaves about 1 cm. long; heads densely clustered, 4 to 5 mm. high; bracts very obtuse.

14. Antennaria oxyphylla Greene. Moist cliffs near Gunsight Pass, and open banks near Lake McDermott. Idaho to Nebr. and Wyo.—Plants 20 to 40 cm. high; leaves spatulate-obovate, 1.5 to 3 cm. long; heads 6 to 7 mm. high.

15. Antennaria sedoides Greene. High rock slides at Iceberg Lake. B. C. to Man. and Colo.—Plants loosely matted, about 10 cm. high; leaves spatulate, about 1 cm. long; heads 5 to 6 mm. high; lower portion of the bracts greenish or brownish.

16. Antennaria umbrinella Rydb. Open slopes at Sun Camp and Cracker Lake; also collected at Duck Lake by Weller. B. C. to Colo.—Plants matted, 7 to 12 cm. high; leaves spatulate, 1 to 1.5 cm. long; heads few, 5 mm. high, densely clustered.

10. ANAPHALIS DC.

1. Anaphalis margaritacea (L.) Benth. & Hook. PEARLY EVERLASTING. Frequent at low altitudes, on dry banks or in woods, swamps, or thickets. Widely distributed in N. Amer.; also in Asia.—Perennial with slender rootstocks, 20 to 40 cm. high; leaves alternate, linear to oblong, 3 to 8 cm. long, entire, white-woolly, sometimes becoming green on the upper surface; heads 6 to 7 mm. high, in a loose or dense cluster; bracts white and papery; flowers yellow; pappus of slender bristles.

The flower heads are conspicuous and rather attractive; they last all summer. It is probably this plant (or perhaps it is one of the species of *Antennaria*) that is seen by tourists, who report that they have found on one of the trails edelweiss "exactly like what I saw when I was in Switzerland." It is scarcely necessary to state that no plant with a very close resemblance to edelweiss is found in the Rocky Mountains.

11. GNAPHALIUM L.

Annuals, biennials, or perennials, with white-woolly pubescence; leaves alternate, narrow, entire; heads without rays, in small dense clusters, the bracts papery; pappus of slender bristles.

Plants biennial, 50 to 80 cm. high; heads nearly glabrous, the clusters not leafy.
1. G. macounii.

Plants annual, 5 to 15 cm. high; heads woolly, the clusters surrounded by leaves.
2. G. palustre.

1. Gnaphalium macounii Greene. TALL CUDWEED. At low altitudes, infrequent; in thin woods or on dry open slopes. B. C. to Ariz., Pa., and N. S. (*G. decurrens* Ives.)—Plants solitary, with 1 or few slender stems; leaves linear or oblanceolate, 4 to 10 cm. long, the upper surface becoming green, covered with small glands; heads 5 mm. high, sometimes in broad panicles, the bracts yellowish white.

2. Gnaphalium palustre Nutt. LOW CUDWEED. East entrance, in open moist ground, frequently about ponds on prairie. B. C. to Calif., N. Mex., and Nebr.—Plants loosely woolly, usually much branched; leaves spatulate or oblanceolate, 1 to 2 cm. long, woolly on both sides; heads 3 to 4 mm. high, in small woolly clusters, the bracts brownish white.

12. ADENOCAULON Hook.

1. Adenocaulon bicolor Hook. PATHFINDER. Abundant on the west slope at low and middle elevations; local on the east slope, frequent about Sun Camp, but apparently absent in the Many Glacier region; in dry or moist woods or thickets. B. C. to Calif., Mont., and L. Superior.—Perennial, with rootstocks, 0.3 to 1 meter high; leaves alternate, triangular and heart-shaped, 5 to 20 cm. long, thin, green on the upper side, white-woolly beneath, with low rounded teeth; heads about 3 mm. long, the 4 or 5 bracts spreading in fruit; flowers pure white; achenes bearing small stalked glands, spreading.

A characteristic plant of the west slope. The very sticky achenes adhere readily to clothing.

13. IVA L.

1. Iva xanthifolia Nutt. Reported from Belton by Jones. Wash. to N. Mex. and Mich. (*Cyclachaena xanthifolia* Fresen.)—Coarse annual, about 1 meter high; leaves mostly opposite, petioled, ovate, 5 to 10 cm. long, toothed, rough-hairy; heads panicled, 4 to 5 mm. broad, the flowers greenish yellow; achenes without pappus.

14. AMBROSIA L. RAGWEED.

Annuals or perennials, strong-scented; leaves mostly opposite, divided into narrow lobes; flowers greenish yellow, in small heads, the staminate and pistillate in separate heads; rays none; achenes hard, with a few short spines; pappus none.

Plants perennial, with rootstocks; leaves once lobed, the lobes usually toothed.
1. A. psilostachya.

Plants annual; leaves twice lobed . . . . . **2. A. elatior.**

1. Ambrosia psilostachya DC. WESTERN RAGWEED. Waste ground about Belton and east entrance; rare and evidently introduced. Calif. to La. and Ill.—Plants 20 to 60 cm. high, with short appressed hairs; leaves thick, with broad lobes; achenes often unarmed.

2. Ambrosia elatior L. COMMON RAGWEED. A few plants along the railroad at Belton; evidently introduced. Widely distributed in N. Amer.—Plants 0.3 to 1 meter high, with appressed or spreading hairs; leaves thin, divided into narrow lobes; achenes with a few sharp spines.

The pollen from this plant is one of the chief causes of hay fever.

15. BALSAMORRHIZA Hook.

1. Balsamorrhiza sagittata (Pursh) Nutt. BALSAMROOT. Frequent on the east slope at low and middle altitudes, on dry open hillsides. B. C. to Calif., Colo., and S. Dak.—Perennial, 30 to 60 cm. high, densely covered with close matted white hairs; root very thick and resinous; leaves arrow-shaped or heart-shaped, erect, 10 to 30 cm. long, long-stalked, entire or nearly so; flower stalk leafless, bearing a few showy heads, the involucre 2.5 cm. broad, the yellow rays 2 to 3 cm. long.

The Blackfoot Indians, like many other western tribes, are said to use the roots for food. In some parts of the West in early days the white settlers also used the roots in times of scarcity, and the plant is known in Utah as "Mormon biscuit."

16. HELIANTHUS L. SUNFLOWER.

Annuals or perennials; leaves opposite or alternate, entire or toothed; heads large, solitary or in corymbs, stalked, the bracts unequal and overlapping; pappus of 2 scales or awns.

Plants annual; upper leaves conspicuously stalked; bracts 5 to 6 mm. wide.
1. H. annuus.

Plants perennial; upper leaves sessile or nearly so; bracts 1.5 to 3 mm. wide.
Leaves ovate, the upper ones opposite; head usually one on each stem; central flowers of the head purplish brown . . . . . **2. H. subrhomboideus.**
Leaves narrowly lanceolate, the upper ones alternate; central flowers yellow.
3. H. fascicularis.

1. **Helianthus annuus** L. COMMON SUNFLOWER. A few plants found on the east slope along railroad and roadsides; evidently introduced. Wash. to Calif., Tex., and Sask. (*H. lenticularis* Dougl.)—Plants 1 to 2 meters high or often lower, hairy; leaves mostly alternate, broadly ovate, rough, toothed, long-stalked; heads 4 to 5 cm. broad.

2. Helianthus subrhomboideus Rydb. Dry shale slopes at east entrance. Man. and Alta. to N. Mex. and Ark.—Plants 30 to 60 cm. high, with slender rootstocks; stems hairy below, purplish; leaves 4 to 8 cm. long, most of them near the base of the stem, short-stalked, very rough, entire or toothed; heads 1.5 to 2 cm. broad, the bracts ovate, hairy on the margins.

3. Helianthus fascicularis Greene. A few plants in dry soil near Many Glacier Hotel; apparently introduced. Alta. and Sask. to N. Mex. and Ariz.—Stems 0.5 to 1 meter high, glabrous or nearly so; leaves 5 to 15 cm. long, rough, nearly entire, the lower ones opposite; heads 2 to 3 cm. broad, the bracts linear.

17. MADIA Molina.

1. Madia glomerata Hook. TARWEED. Common on the east slope at low altitudes, on prairie or open hillsides, often in cultivated ground and about dried-up ponds on prairie. B. C. to Calif., N. Mex., and Sask.—Annual, 20 to 40 cm. high, hairy and very sticky; leaves alternate, entire, linear; heads about 6 mm. high, the bracts inclosing the achenes; flowers yellow, the rays very short, 3-lobed; pappus none.

The plant has a strong and unpleasant odor.

18. HYMENOXYS Cass.

1. Hymenoxys richardsonii (Hook.) Cockerell. Collected on dry hills at east entrance by Umbach. Sask. to Mont.—Perennial, 10 to 30 cm. high, usually in small

dense clumps, slightly hairy; leaves alternate, divided into narrowly linear lobes; heads 1 or few, 8 mm. high; flowers yellow; pappus of 5 scales.

From a closely related species of Colorado, rubber was for a time extracted upon a commercial scale.

19. GAILLARDIA Foug.

1. Gaillardia aristata Pursh. BROWN-EYED SUSAN. Common on the east slope at low and middle altitudes, infrequent on the west slope, but found at Belton and doubtless elsewhere; on prairie or open slopes; occasionally growing on slopes above timber line. B. C. to Oreg., Colo., and S. Dak.—Perennial, 30 to 60 cm. high, hairy; leaves oblanceolate, entire or more commonly toothed or lobed; heads long-stalked, the involucre 2 to 3 cm. broad, the rays 2 to 3 cm. long, broad, 3-lobed, yellow, often purplish at the base; disk flowers brownish purple.

A handsome plant, often cultivated under the name of blanket-flower. The cultivated plants are scarcely superior to some of the wild ones in the size of their heads.

20. ACHILLEA L.

1. Achillea lanulosa Nutt. YARROW. Common, especially at high and low altitudes, in meadows or on rock slides, open slopes, or prairie. B. C. to Calif., Mex., Sask., and Ont.—Perennial, 15 to 50 cm. high, with a strong odor, silky-hairy; leaves alternate, also in basal tufts, 3 to 10 cm. long, plumelike, 2 or 3 times divided into numerous small narrow lobes; heads 4 to 5 mm. high, in flat-topped clusters, the bracts with brown borders; rays 2.5 to 4 mm. long, white, rarely pink; pappus none.

Yarrow is one of the common plants in nearly all parts of the United States. The leaves are very handsome.

21. MATRICARIA L.

1. Matricaria matricarioides (Less.) Porter. PINEAPPLE-WEED. Frequent on the east slope at low altitudes, in waste ground or on open slopes or prairie. Alaska to Calif., Ariz., and N. Dak.; also in Eur. (*Chamomilla suaveolens* Rydb.)—Annual, nearly glabrous, 5 to 30 cm. high, usually much branched; leaves alternate, 2 or 3 times divided into short linear lobes; heads without rays, 6 to 8 mm. broad, the disk rounded; bracts thin, with whitish margins; flowers greenish yellow; pappus an inconspicuous crown.

The plant has a strong but not unpleasant odor. The dried flowers were used by the Blackfoot Indians as a perfume.

22. CHRYSANTHEMUM L.

The cultivated chrysanthemums belong to this genus.

1. Chrysanthemum leucanthemum L. OX-EYE DAISY. Occasional about Belton, on brushy slopes or in waste ground. Native of Eur.; naturalized as a weed in N. Amer. (*Leucanthemum leucanthemum* Rydb.)—Perennial, 30 to 100 cm. high, glabrous; leaves linear to obovate, toothed or lobed; heads long-stalked, the involucre about 1.5 cm. broad, the bracts with a narrow brown band near the margin; rays white, 12 to 15 mm. long.

One of the commonest weeds of the eastern States, but rare in the Rocky Mountains.

23. ARTEMISIA L. WORMWOOD.

Herbs or shrubs, usually perennial, with aromatic odor and bitter flavor; leaves alternate, usually white-woolly; heads small, paniced, without rays; achenes usually glabrous, without pappus.

Plants shrubby. Leaves linear, entire . . . . . **1. A. cana.**
Plants herbaceous.
  Leaves glabrous.
    Leaves divided into numerous linear lobes . . . . . **2. A. biennis.**
    Leaves linear, entire . . . . . **3. A. dracunculoides.**

Leaves hairy or woolly.
Leaves silky-hairy, the hairs straight, not matted; leaves divided into numerous linear lobes.
Leaves 1 to 1.5 cm. long, densely covered with white silky hairs; heads very hairy. . . . . **4. A. frigida.**
Leaves 3 to 12 cm. long or longer, thinly hairy; heads glabrous or slightly hairy.
Heads very numerous, 2 to 3 mm. broad . . . . . **5. A. forwoodii.**
Heads few, 4 to 5 mm. broad . . . . . **6. A. spithamaea.**
Leaves woolly, at least on the lower surface, with matted white hairs.
Leaves twice divided into linear lobes, often green on the upper surface. **7. A. discolor.**
Leaves entire, toothed, or once lobed, white on both surfaces.
Lower leaves entire or shallowly toothed . . . . . **8. A. gnaphaloides.**
Lower leaves lobed.
Leaves deeply lobed, the lobes numerous, linear or oblong . **9. A. floccosa.**
Leaves with a few (3 or 5) broad lanceolate lobes . . . **10. A. diversifolia.**

1. Artemisia cana Pursh. SAGEBRUSH. Frequent on prairie about the east entrance. Oreg. to Sask., Colo., and Utah.—Densely branched shrub, 30 to 60 cm. high, covered with fine whitish hairs; leaves 2 to 4 cm. long, acute; heads in a spikelike panicle.

The common sagebrush, *Artemisia tridentata* Nutt., apparently does not grow about the park.

2. Artemisia biennis Willd. In dried-up pools on prairie about the east entrance; scarce. B. C. to Calif., N. J., and N. S.—Biennial, 30 to 100 cm. high, with purplish stems; lobes of the leaves linear or lanceolate, toothed or lobed; heads 2 to 3 mm. wide, in a dense, very leafy panicle; flowers yellow.

3. Artemisia dracunculoides Pursh. Dry flats near St. Mary and Babb. B. C. to Calif., Tex., and Mo.—Plants perennial, erect, 0.5 to 1 meter high, glabrous; leaves 3 to 7 cm. long; heads glabrous, 2 to 3 mm. wide.

4. Artemisia frigida Willd. Rocky flats or prairie about St. Mary and the east entrance, frequent; dry gravel bank near Belton, rare. Alaska to Idaho, Ariz., and Tex.; also in Asia.—Silky-hairy perennial, 15 to 40 cm. high, forming dense silvery clumps; leaves twice divided into very slender lobes; heads 4 to 5 mm. broad, in narrow panicles; flowers yellow.

Among the Blackfoot Indians a decoction of the plant was used as a drink in cases of fever. The leaves were chewed as a remedy for heartburn. Branches were generally tied to articles which were offered to the sun.

5. Artemisia forwoodii S. Wats. Occasional on the east slope at low altitudes, on open rocky hillsides or on flats. Yukon to Ont., Mich., and Ariz. (*A. camporum* Rydb.)—Plants in clumps, 20 to 50 cm. high, with stout stems; leaves long-stalked, 2 or 3 times divided into linear lobes; heads 2 to 3 mm. high, in narrow dense panicles.

6. Artemisia spithamaea Pursh. Collected on Mount Henry by Umbach. Wash. to Colo., Que., and Greenl.—Similar in appearance to *A. forwoodii*, but the plants lower, 10 to 30 cm. high; leaves once or twice divided into linear lobes.

7. Artemisia discolor Dougl. Frequent at nearly all altitudes on the east slope, on the west slope chiefly at high altitudes; on open, usually rocky slopes, on rock slides, or in thickets; frequent above timber line. B. C. and Wash. to Sask. and Colo. (*A. michauxiana* Besser.)—Perennial, 20 to 50 cm. high, forming dense bushy clumps; leaves 3 to 6 cm. long, white-woolly beneath, often green and glabrous on the upper surface; heads 3 to 4 mm. high, green, in narrow, usually spikelike panicles.

The plants are somewhat variable. The typical form has a narrow panicle and rather broad leaf segments; *A. michauxiana* is the form with spikelike panicles and narrow leaf segments. Both forms occur in the park, but the second one is much more common.

8. Artemisia gnaphaloides Nutt. Frequent at low altitudes, on dry, open or brushy slopes or in low thickets; rarely found on open slopes above timber line. Alta. to Colo., Tex., Mo., and Ont.—Plants whitish, 30 to 60 cm. high, often forming large patches; leaves lanceolate or oblanceolate, 2 to 10 cm. long, the upper ones entire, the lower mostly toothed, sharp-pointed; heads 4 mm. high, white-woolly, in narrow spikelike panicles.

9. Artemisia floccosa Rydb. Low thickets below Lake McDermott, and brushy slopes along Appekunny Creek. Oreg. to Mont. and Wyo.—Plants 20 to 40 cm. high; often forming dense clumps, whitish; leaves 3 to 5 cm. long, the upper ones often entire; heads about 4 mm. high, white-woolly.

10. Artemisia diversifolia Rydb. Frequent at low and middle altitudes, on open, gravelly or grassy slopes or dry prairie. B. C. to Calif., Colo., and Nebr.—Plants whitish, 30 to 80 cm. high, often forming broad dense clumps; lower leaves 5 to 10 cm. long, with 3 or 5 lobes pointing forward, the upper leaves mostly entire; heads 3 to 4 mm. high, woolly, in narrow panicles; flowers pale yellow.

It is probable that this and *A. floccosa* are merely forms of *A. gnaphaloides*.

24. PETASITES L.

1. Petasites sagittata (Pursh) A. Gray. SWEET COLTSFOOT. Not common, but found in swampy meadows below Lake McDermott and at St. Mary and Grinnell Lake. Alaska to Colo., Minn., and Lab.—Perennial, with thick rootstocks; flower stalk with bracts but no leaves, 20 to 30 cm. high, bearing a few heads; leaves all rising from the ground, long-stalked, heart-shaped or triangular, 15 to 40 cm. long, shallowly toothed, green on the upper side, white-woolly beneath; heads 7 to 10 mm. long, the flowers purplish or whitish.

The flowers appear early in the season. The leaves are conspicuous and remind one somewhat of those of burdock.

25. ARNICA L.. ARNICA.

Perennials with rootstocks, more or less hairy; stems leafy, the leaves opposite, entire or toothed; heads 1 or few, large, the bracts equal in length; rays yellow, rarely absent; pappus of slender, white or brownish bristles.—The species are difficult to distinguish, and they are imperfectly understood; it is doubtful whether all those listed below are valid. The arnica used as a drug is obtained from a European species of this genus. In our species the rootstocks have the characteristic arnica flavor and odor. The arnicas are among the most abundant and showy flowers of the park.

Rays none . . . . . **1. A. parryi.**
Rays present, showy.
  Pappus brownish or yellowish, finely hairy.
    Stem leaves narrowly lanceolate, entire or minutely toothed, finely hairy; achenes hairy and with fine glands . . . . . **2. A. longifolia.**
    Stem leaves lanceolate or ovate, usually coarsely toothed, coarsely hairy; achenes hairy but without glands.
      Basal leaves not heart-shaped . . . . . **3. A. mollis.**
      Basal leaves heart-shaped . . . . . **4. A. diversifolia.**
  Pappus white, merely roughened, not hairy.
    Basal leaves heart-shaped or broadly ovate, usually long-stalked.
      Achenes densely hairy . . . . . **5. A. cordifolia.**
      Achenes glabrous or glandular or with a few scattered hairs above.
        Heads (from base to end of pappus) 10 to 12 mm. high . . . . **6. A. gracilis.**
        Heads 15 to 18 mm. high.
          Lower stem leaves stalked; heads turbinate . . . . . **7. A. latifolia.**
          Lower stem leaves sessile; heads campanulate . . . . . **8. A. granulifera.**

Basal leaves lanceolate or oblanceolate, short-stalked.
Stems with numerous pairs of leaves, the upper leaves not much reduced.
9. A. foliosa.

Stems with 1 to 3 pairs of leaves, the upper ones much reduced.
Heads campanulate, covered with viscid hairs; plants of low altitudes.
10. A. fulgens.

Heads turbinate, hairy but not viscid; plants of alpine situations.
Leaves glabrous or thinly hairy, green . . . . . **11. A. alpina.**
Leaves densely covered with long soft whitish hairs . . **12. A. tomentosa.**

1. Arnica parryi A. Gray. RAYLESS ARNICA. Aspen thicket at east entrance; moist open hillside on trail to Iceberg Lake. B. C. to Oreg., Colo., and Alta.—Stems hairy, leafy, 20 to 50 cm. high; basal leaves ovate or oblong, entire or slightly toothed, hairy; heads 3 to 9, 12 to 15 mm. high, dull yellow; pappus brownish.

2. Arnica longifolia D. C. Eaton. Frequent, especially at low and high altitudes, in alpine meadows, in wet thickets, or on open slopes. Wash. to Calif., Colo., and Mont.—Plants often tufted, very viscid, 25 to 60 cm. high; leaves mostly linear-lanceolate, 5 to 15 cm. long, bright green, minutely hairy, sessile; heads few, about 1 cm. high.

3. Arnica mollis Hook. Common at low and middle altitudes, in damp woods or wet thickets, along streams, on open slopes, or in bogs; frequently found in wet meadows above timber line. B. C. and Wash. to Colo. and Alta.—Plants green, hairy, 20 to 60 cm. high, often forming dense clumps; stem leaves sessile, 4 to 10 cm. long; heads 1 to 5, 12 to 15 mm. high.

4. Arnica diversifolia Greene. Moist rocky slopes at Sexton Glacier, and perhaps elsewhere. B. C. to Calif., Mont., and Alta.—Plants 25 to 50 cm. high, finely glandular-hairy, basal leaves usually toothed, the stem leaves ovate to lanceolate, sessile; heads 1 to 5.

5. Arnica cordifolia Hook. Collected in thickets at east entrance by Umbach; also obtained by Williams at Columbia Falls, and probably to be found about Belton. B. C. to Calif., N. Mex., and Alta.—Stems hairy, 20 to 50 cm. high; basal leaves broadly heart-shaped, 3 to 10 cm. long, usually toothed; stem leaves 2 to 4 pairs, mostly stalked; heads 1.5 to 2 cm. high, hairy.

6. Arnica gracilis Rydb. Abundant near and above timber line, in wet meadows or on open slopes or rock slides; occasionally found in wet thickets at middle altitudes. B. C. and Wash. to Wyo. and Alta.—Stems 10 to 50 cm. high, glabrous or nearly so; basal leaves ovate to rounded, toothed or entire, 2 to 6 cm. long; stem leaves 2 to 4 pairs, the lower ones stalked; heads 1 to 5.

7. Arnica latifolia Bong. Abundant on the east slope at low and middle altitudes, usually in deep woods. Alaska to Utah and Colo.—Stems 30 to 70 cm. high; basal leaves heart-shaped, 5 to 15 cm. long, toothed, finely hairy or nearly glabrous; heads usually 5 to 9; bracts minutely glandular and sometimes hairy.

Very abundant and showy about Lake McDermott, often forming large dense patches in the woods. The plants bloom in the early summer and do not remain in flower long.

8. Arnica granulifera Rydb. Frequent in alpine meadows; sometimes in woods at middle altitudes. Mont.—Stems 25 to 35 cm. high, somewhat hairy; basal leaves ovate, usually absent at flowering, slightly toothed; stem leaves broadly ovate, 4 to 9 cm. long, toothed, obtuse; heads 1 to 5.

9. Arnica foliosa Nutt. Frequent on the east slope at low altitudes, in wet meadows or thickets, in aspen woods, or about low places on prairie. Alaska to Utah and Colo.—Stems 20 to 60 cm. high, woolly; leaves linear or linear-lanceolate, densely and finely hairy, 5 to 10 cm. long, usually entire, the lower ones slender-stalked; heads 1 to 7, 8 to 10 mm. high, often woolly.

10. Arnica fulgens Pursh. Collected along Kennedy Creek by Weller. B. C. to Calif., Colo., and S. Dak. (*A. pedunculata* Rydb.)—Stems 20 to 40 cm. high, hairy; leaves mostly basal, oblong to linear-lanceolate, 5 to 10 cm. long, finely hairy, entire; heads 1 or 3, 12 to 15 mm. high.

11. Arnica alpina (L.) Olin. Common above timber line, on rock slides or rocky slopes or in meadows. Alaska to Wash., Colo., Alta., Lab., and Greenl.; also in Eur.—Stems 10 to 20 cm. high, somewhat hairy; stem leaves 1 to 3 pairs, mostly lanceolate, toothed or entire; heads 1 to 3, about 1 cm. high.

12. Arnica tomentosa Macoun. Open rocky slopes and summits at Piegan Pass and Sexton Glacier. B. C., Alta., and Mont.—Stems 8 to 12 cm. high, densely woolly; stem leaves 1 or 2 pairs, lanceolate, entire; head 1, 10 to 12 mm. high.

26. SENECIO L. Ragwort.

Perennials or rarely annuals; leaves alternate, entire, toothed, or lobed; heads 1 to many, with conspicuous yellow rays (except in one species); involucre composed of one series of equal (not overlapping) linear bracts, with a few short bracts at the base; achenes very narrow, with pappus of soft white bristles.

Plants annual; rays none . . . . . **1. S. vulgaris.**
Plants perennial; rays present.
Heads about 2.5 cm. high . . . . . **2. S. megacephalus.**
Heads less than 1.5 cm. high.
Lowest leaves entire, densely white-woolly on both sides.
Bracts about 21 . . . . . **3. S. canus.**
Bracts about 13 . . . . . **4. S. purshianus.**
Lowest leaves more or less toothed, green.
Leaves triangular, sharp-pointed, toothed . . . . . **5. S. triangularis.**
Leaves not triangular, often blunt-pointed, toothed or lobed.
Upper stem leaves not much if at all smaller than the lower ones; plants in small bushy clumps . . . . . **6. S. fremontii.**
Upper stem leaves much smaller than the lower ones; plants erect, never in bushy clumps.
Stem bearing 1 or rarely 2 heads.
Heads and leaf stalks woolly at the base; leaves very thick and fleshy. **7. S. conterminus.**
Heads and leaf stalks glabrous . . . . . **8. S. ovinus.**
Stem bearing several or numerous heads.
Stem leaves toothed; lowest leaves sharp-pointed; bracts with dark tips . . . . . **9. S. hydrophiloides.**
Stem leaves lobed; lowest leaves rounded at the tip; bracts not with dark tips.
Leaves at base of stem mostly 2 to 3 cm. long, long-tapering at base, thick and fleshy . . . . . **10. S. cymbalarioides.**
Leaves at base of stem mostly 4 to 7 cm. long, never long-tapering at base, thin.
Lower leaves mostly broadly notched at base, the teeth usually low and blunt . . . . . **11. S. pseudaureus.**
Lower leaves truncate to acute at base, the teeth mostly sharp and spreading . . . . . **12. S. burkei.**

1. Senecio vulgaris L. Weed in garden at Lewis's; reported from Belton by Jones. Native of Eur.; naturalized in N. Amer.—Plants 10 to 40 cm. high, nearly glabrous; leaves deeply lobed; heads 7 to 9 mm. high, the bracts with black tips.

2. Senecio megacephalus Nutt. Frequent at middle and high altitudes, usually on open slopes. B. C., Idaho, Mont., and Alta.—Plants 20 to 60 cm. high, usually in dense clumps; leaves oblanceolate or oblong, 5 to 20 cm. long, thick, woolly at

first but becoming glabrous and green; heads 1 to 3, woolly, very showy; rays deep yellow, 1.5 to 2 cm. long.

3. Senecio canus Hook. Frequent at nearly all altitudes, on open slopes or in low meadows; infrequent above timber line. B. C. to Calif., Colo., and Nebr.—Plants tufted, 20 to 40 cm. high, whitish; leaves at base of stem rounded to oblong, long-stalked, the stem leaves usually lobed, sessile; heads numerous, 10 to 12 mm. high, nearly glabrous; rays bright yellow.

4. Senecio purshianus Nutt. Occasional at low altitudes on the east slope, in dry rocky soil. B. C. to Sask., Tex., and Utah.—Plants tufted, 10 to 25 cm. high, similar in appearance to *S. canus;* heads few, mostly 7 to 8 mm. high.

5. Senecio triangularis Hook. TALL RAGWORT. Common nearly everywhere except at the highest altitudes, most abundant at middle elevations and just above timber line; in moist or wet woods or thickets or on moist open slopes. Alaska to Calif., N. Mex., and Sask. (*S. saliens* Rydb.)—Stems erect, often clustered, 0.2 to 1.5 meters high, glabrous; stems very leafy; leaves 3 to 20 cm. long, stalked, coarsely toothed; heads few or numerous, 6 to 10 mm. high; rays bright yellow.

Senecio saliens is a low form with thick and somewhat fleshy leaves; it is common above timber line, often growing with the typical form and grading insensibly into it. The plants are showy, but they do not remain long in flower.

6. Senecio fremontii Torr. & Gray. Abundant on rocky slides and open slopes above timber line; occasional on open rocky slopes at middle altitudes. B. C. to Oreg., Wyo., and Mont.—Plants usually forming dense bushy clumps 10 to 15 cm. high, glabrous; leaves rounded to obovate, 1.5 to 3 cm. long, coarsely toothed, fleshy, sessile, or short-stalked; heads 8 mm. high, 1 or few on each stem; rays bright yellow.

One of the handsomest and most conspicuous plants of alpine slopes.

7. Senecio conterminus Greenm. Frequent on the highest rock slides and on exposed rocky summits. Mont., B. C., and Alta.—Plants solitary or in small tufts, somewhat woolly, especially at first; basal leaves long-stalked, rounded, 1 to 1.5 cm. long, with few low teeth; head 8 to 10 mm. high; bracts usually purplish; rays bright yellow.

The species has not been reported previously from Montana.

8. Senecio ovinus Greene. Common above timber line, in wet meadows and on rocky slopes. Alta. and B. C. to Wyo.—Plants often tufted or matted, glabrous, 5 to 15 cm. high; basal leaves rounded, long-stalked, 1 to 2 cm. long, with few low teeth; heads 7 to 8 mm. high; rays bright yellow.

A handsome and often conspicuous little plant.

9. Senecio hydrophiloides Rydb. Frequent at low altitudes on the east slope, in marshes, low meadows, or wet thickets; on wet slope at Iceberg Lake. B. C. and Wash. to Mont.—Plants solitary, 50 to 90 cm. high, somewhat woolly when young but becoming glabrous; basal leaves long-stalked, oblanceolate or nearly ovate, with fine spreading teeth, somewhat fleshy; heads about 1 cm. high, narrow.

10. Senecio cymbalarioides Nutt. Open slopes at Cracker Lake; also at the east entrance and Duck Lake. B. C. and Mack. to N. Mex.—Plants 20 to 30 cm. high, nearly glabrous; basal leaves with few low teeth; heads several, 7 to 9 mm. high.

11. Senecio pseudaureus Rydb. Low thickets at east entrance; common. B. C. to Sask., N. Mex., and Calif.—Plants 30 to 60 cm. high, bright green, nearly glabrous; basal leaves long-stalked, obtuse, the stem leaves deeply toothed or lobed; heads 8 to 10 mm. high.

12. Senecio burkei Greenm. Common at low altitudes, in wet woods, thickets, or meadows, along streams, and rarely on open slopes. B. C. and Idaho to Minn.—Plants 30 to 80 cm. high, nearly or quite glabrous; leaves bright green, the lower ones on long slender stalks, the upper ones deeply lobed; heads usually few, 10 to 12 mm. high.

27. CIRSIUM Hill. THISTLE.

Coarse biennials or perennials; leaves alternate, toothed or lobed, very spiny; heads large, without rays, the bracts tipped with spines; pappus of hairy bristles.

Leaves closely white-woolly on both sides . . . . . **1. C. undulatum.**
Leaves green, or woolly only on the under side.
Stems winged; upper surface of the leaf covered with small appressed spines.
2. C. lanceolatum.
Stems not winged; upper surface of the leaf not spiny.
Bracts with loose cobwebby hairs; leaves woolly on the under side.
3. C. hookerianum.
Bracts not hairy; leaves glabrous or nearly so . . . . . **4. C. arvense.**

1. Cirsium undulatum (Nutt.) Spreng. PRAIRIE THISTLE. Dry shale slopes at east entrance. B. C. to Ariz. and Mich.—Plants 30 to 60 cm. high; leaves with short broad lobes; heads few, 3 to 4 cm. high; bracts with stout spiny tips, not woolly; flowers rose-purple.

2. Cirsium lanceolatum (L.) Hill. COMMON THISTLE. Infrequent on the east slope, but common on the west slope, in woods or fields or on open hillsides. Native of Eur.; widely naturalized in N. Amer.—Plants about a meter high, green, the stems with spine-toothed wings; leaves deeply lobed, extremely spiny, thinly woolly beneath; heads usually numerous, 4 to 5 cm. high, the bracts with slender sharp spines; flowers rose-purple.

A few plants with white flowers were found. It is very unfortunate that this noxious weed has become so abundant on the west slope; it grows everywhere at low altitudes through the woods and well up along the trails. At Belton it forms almost impenetrable tangles of considerable extent. On the east slope it is still rare, but it is likely to become abundant.

3. Cirsium hookerianum Nutt. WHITE THISTLE. Common, especially on the east slope, at low and middle altitudes, in woods or on open slopes; occasionally in meadows above timber line. B. C., Alta., and Mont.—Plants 0.3 to 1 meter high, green; leaves oblong-oblanceolate, lobed or often toothed, green on the upper surface and sometimes underneath; heads few or numerous, 3 to 4 cm. high, the bracts ending in sharp spines; flowers dirty white.

Above timber line the plants often flower when only 15 cm. high.

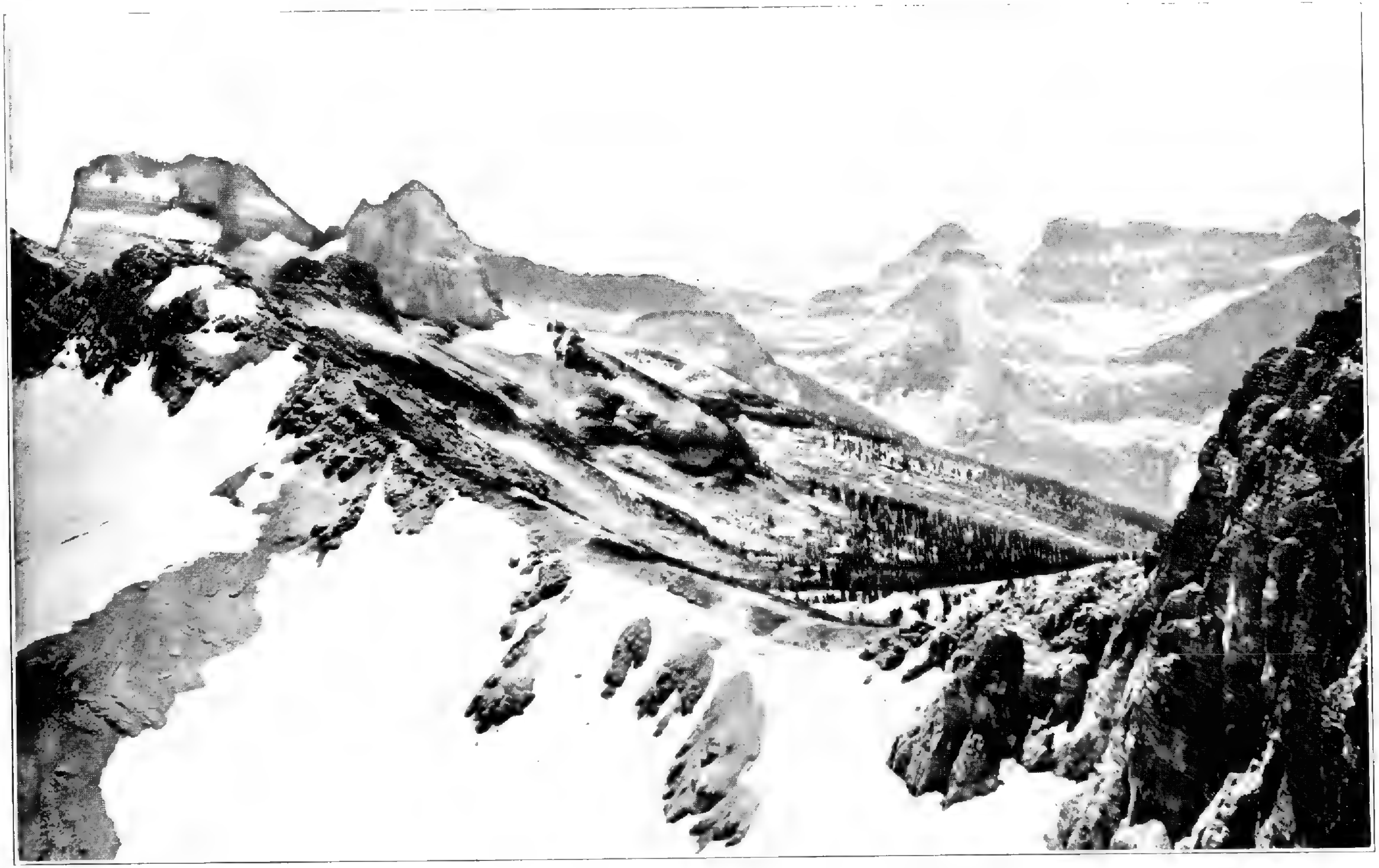
4. Cirsium arvense (L.) Scop. CANADA THISTLE. Occasional about Belton, along the railroad and in cultivated fields. Native of Eur.; naturalized as a weed in N. Amer.—Plants 0.3 to 1 meter high, with long rootstocks, green, glabrous or nearly so; leaves with short lobes; heads usually numerous, about 2 cm. high, the bracts with very short spines; flowers purple.

The following family should have been inserted on page 326, preceding the Santalaceae:

LORANTHACEAE. Mistletoe Family.

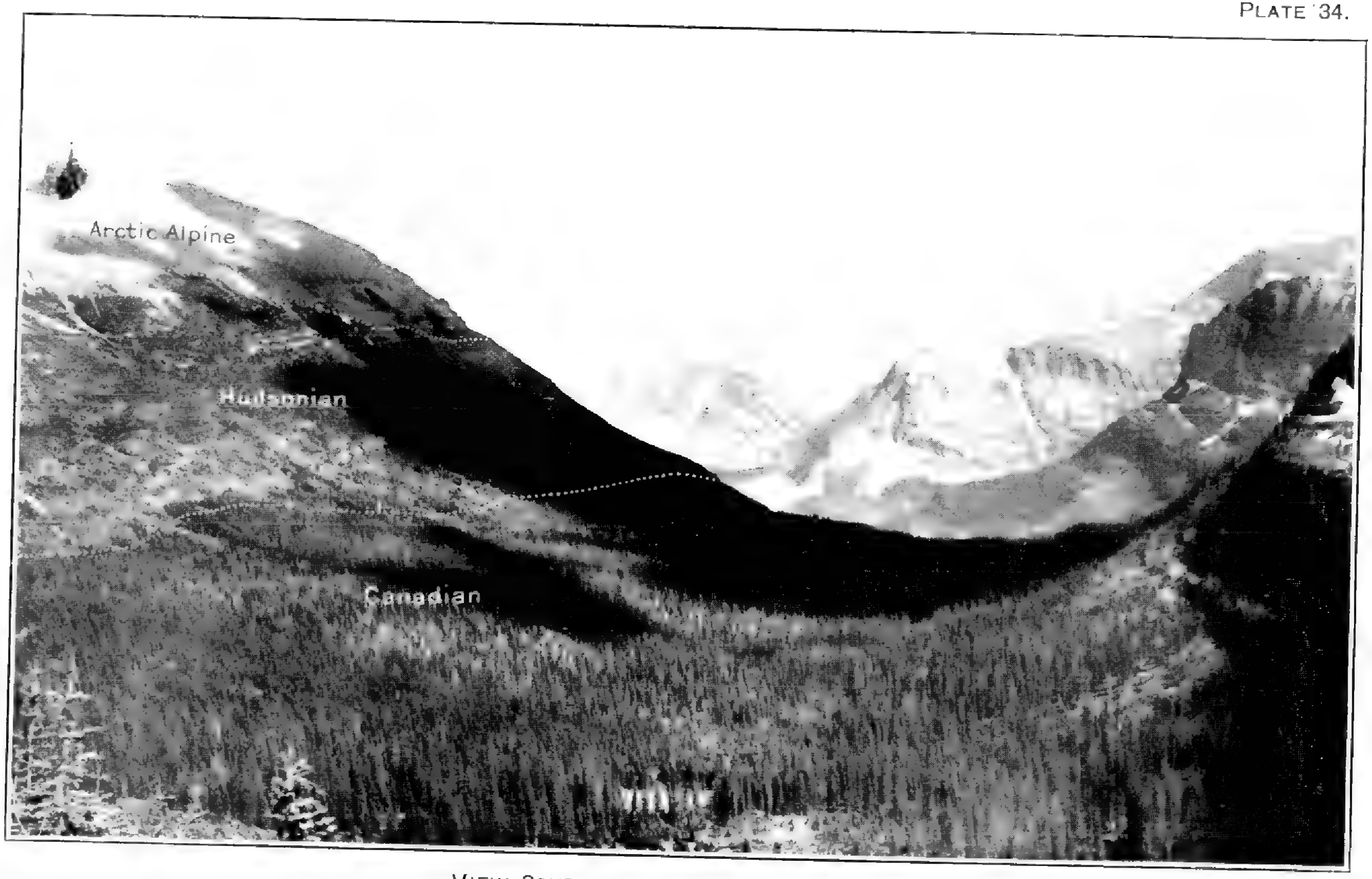
1. RAZOUMOFSKYA Hoffm.

1. Razoumofskya americana (Nutt.) Kuntze. Occasional on the east slope, parasitic upon the branches of lodgepole pine. B. C. to Colo. and Sask.—Plants yellowish, 2 to 10 cm. high, branched, glabrous; leaves opposite, reduced to scales; flowers solitary, axillary, minute; fruit a small blue berry.



VIEW SOUTH FROM THE GARDEN WALL, SHOWING THE MOUNTAINS OF THE WEST SLOPE.

The slopes are mostly above timber line; the timber visible consists chiefly of fir and spruce, of the Hudsonian Zone. Photograph by Scenic America Company; from National Park Service.



VIEW SOUTHEAST FROM ICEBERG LAKE.

The dotted lines indicate the limits of the life zones: (1) Canadian, the heavily timbered valleys and lower slopes, covered chiefly with fir, spruce, and Douglas fir. (2) Hudsonian, with a scattered growth of small fir, spruce, and pine, and intervening meadows. (3) Arctic Alpine, the area wholly above timber line. Photograph from National Park Service.

Contr. Nat. Herb. V. 22

SWIFTCURRENT VALLEY.

Chief Mountain in the distance. The dark areas are timbered and belong to the Canadian Zone. The tree in the foreground is a lumber pine. The light-colored areas, clothed with grasses and other herbs, are characteristic of the Transition Zone, as represented on the east slope. Photograph by Fred H. Kiser; from National Park service.

PLATE 36.

POND NEAR SWIFTCURRENT CREEK BELOW LAKE MCDERMOTT.

The vegetation is that of the Canadian Zone, the trees chiefly fir and spruce. The marshes are filled with grasses and sedges, and the border thickets are composed of willows. Beaver dam in the foreground. Photograph by Fred H. Kiser, from National Park Service.

VIEW FROM A POINT NEAR GRANITE PARK; HEAVENS PEAK AT THE RIGHT.

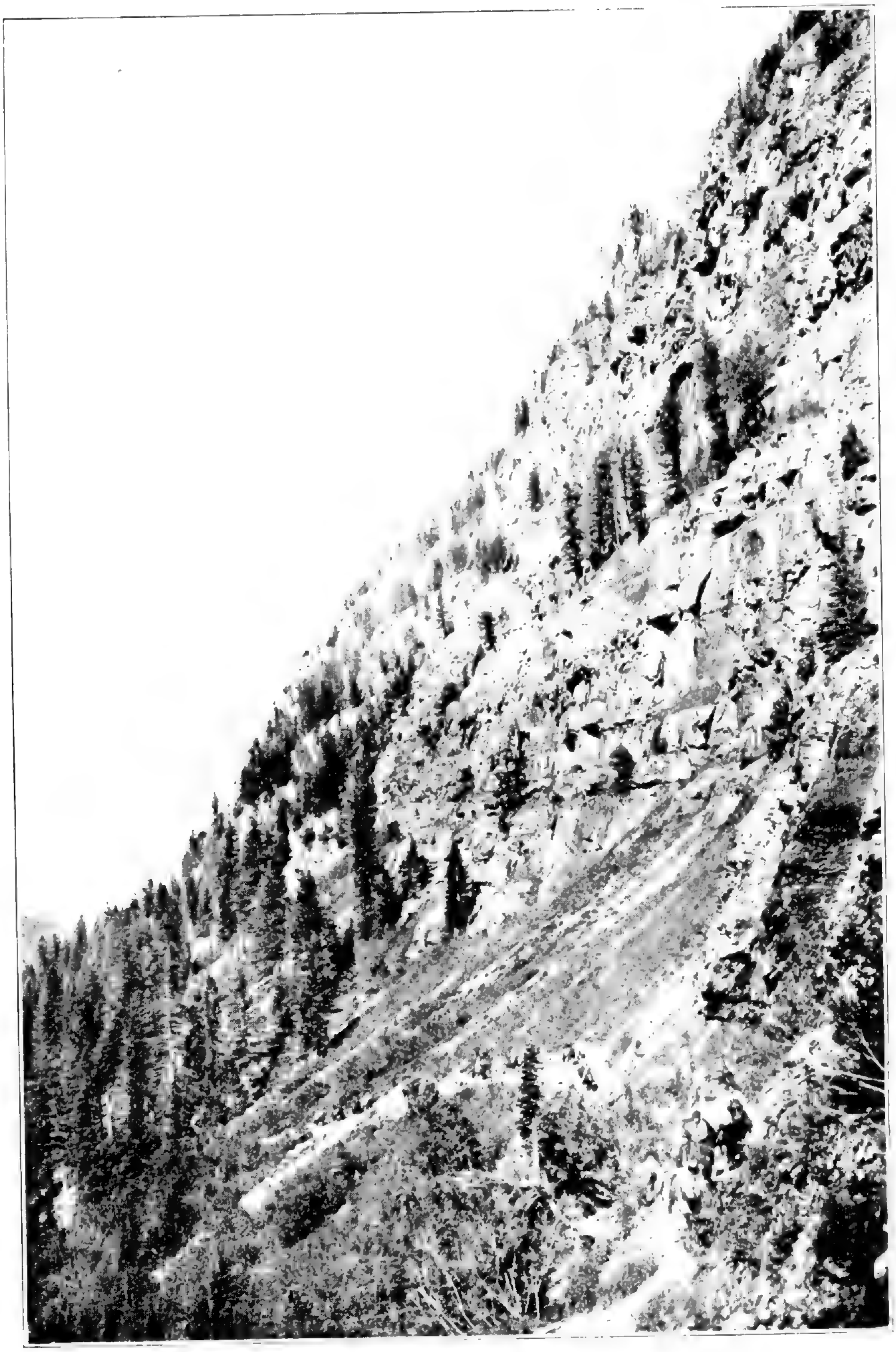
The heavy timber in the distance is characteristic of the Canadian Zone, as represented on the west slope at middle altitudes. The trees in the foreground are mostly stunted alpine firs. Photograph by Fred H. Kiser; from National Park Service.

A. LIMBER PINE (PINUS FLEXILIS), ON ALTYN PEAK, OVERLOOKING LAKE McDERMOTT.

Trees of this species growing in exposed places are usually contorted by the wind. The foggy appearance of the distant portions of the view is due to smoke from forest fires.

B. DENSE FOREST OF HEMLOCK AND GIANT CEDAR NEAR LAKE McDONALD.

The shrubby undergrowth consists of yews and young hemlocks



MOUNTAIN SIDE BELOW SPERRY CHALETS.

A characteristic scene in the Canadian Zone. A large rock slide is shown at the foot of the cliff, covered with various shrubs. Photograph by Fred H. Kiser; from National Park Service.

A SHORE OF LAKE MCDONALD.

The trees are chiefly larch and western white pine; those along the beach are cottonwood, mountain alder, and canoe birch.

B. SPHAGNUM BOG AT JOHNS LAKE.

The encroachment of the forest is indicated by the young trees. The portion of the bog shown is overgrown with coarse grasses and is not typical. Pondlilies are growing in the lake

VIEW ON THE TRAIL TO PIEGAN PASS.

The vegetation is that of the Hudsonian Zone, the trees being fir and spruce. The white flowers are those of beargrass, *Xerophyllum tenax*. Photograph by Fred H. Kiser, from National Park service.

A. DWARFED TREES AT SWIFTCURRENT PASS.

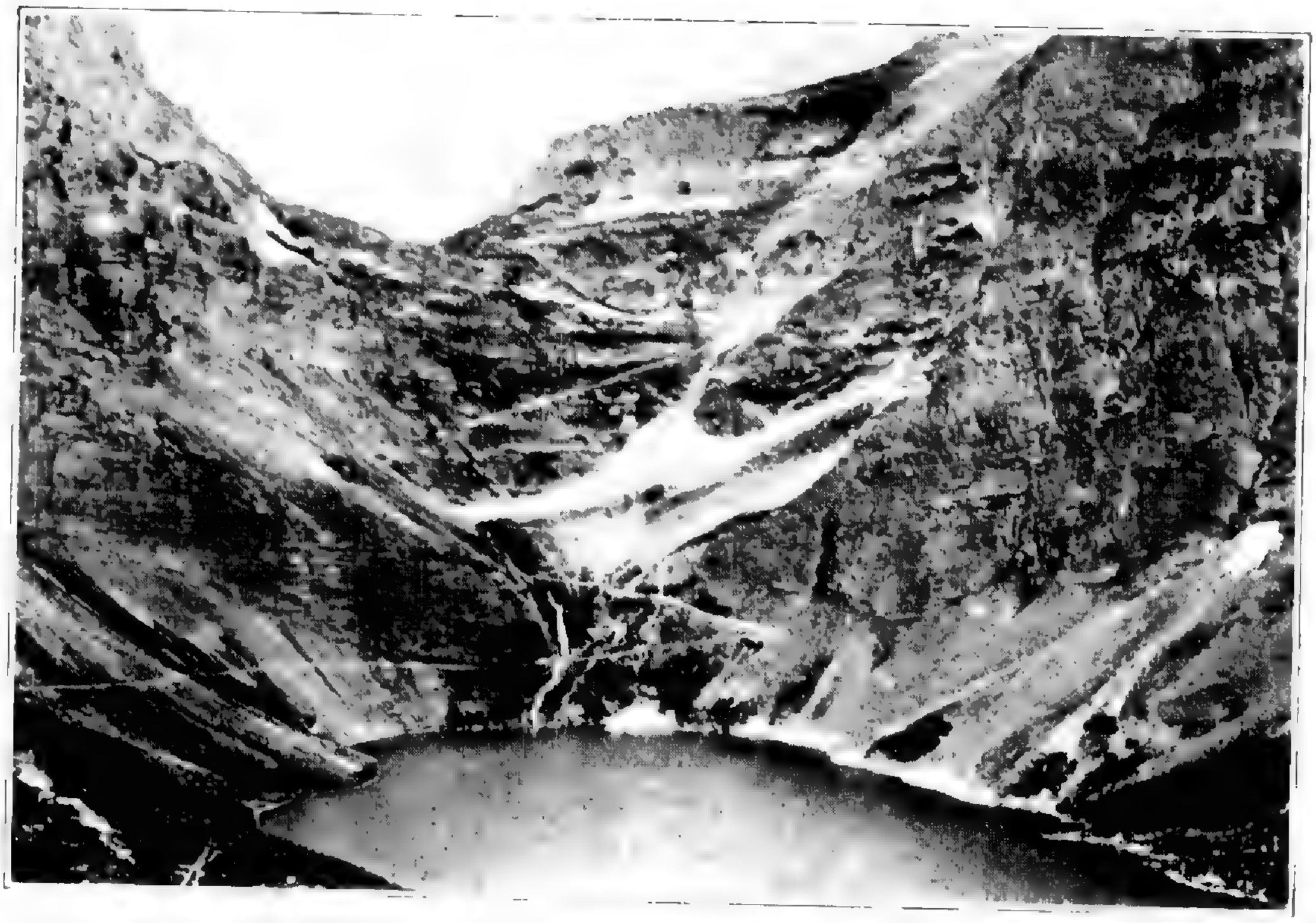
A characteristic formation of the Hudsonian Zone. The trees are mostly alpine fir and whitebark pine and average about 2 meters in height. Their branches extend to the ground, and in the more exposed places the trunks are often prostrate.

B. MEADOW NEAR GRANITE PARK.

One of the flower fields of the Hudsonian Zone. The flowers are mostly showy fleabane (*Erigeron salsuginosus*), but there was present an equal amount of red Indian paintbrush not visible in the photograph. The trees are chiefly alpine fir. The hazy appearance of the distant portions of the view is due to smoke from forest fires.

PTARMIGAN LAKE IN MIDSUMMER.

On the east slope near Iceberg Lake. A typical Arctic-Alpine area. Some heavy timber, of the Canadian Zone, is visible in the distance at a lower elevation. The dark areas at the right are thickets of willow bushes. The slopes of loose stones, which appear barren of vegetation, are furnished with a sparse growth of showy-flowered herbaceous plants. The water of the lake is turquoise-blue. Photograph from National Park Service.



A. LAKE ELLEN WILSON AND GUNSIGHT PASS.

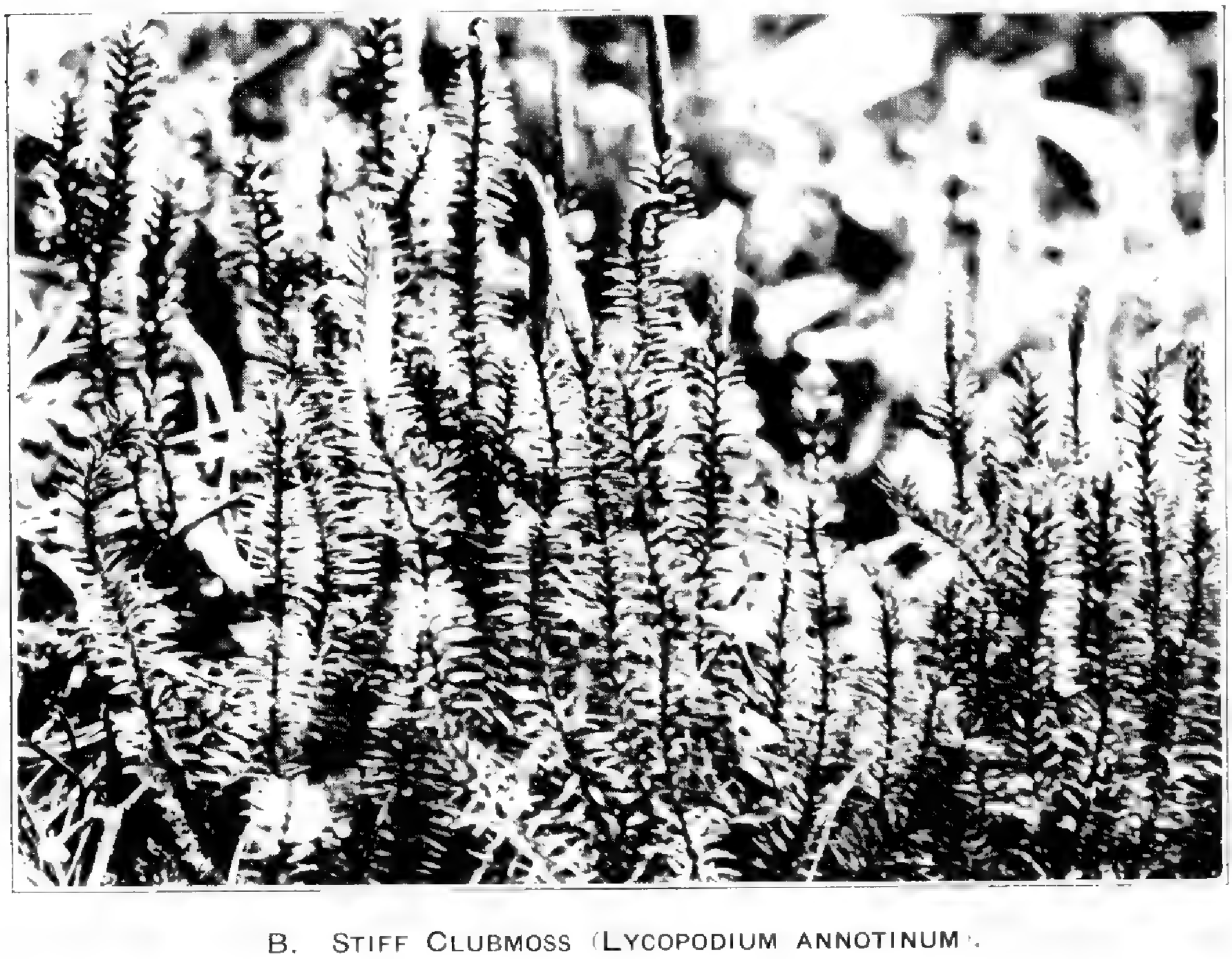
The zigzag line is the trail from Gunsight Pass to Sperry Chalets. This area is nearly all Arctic-Alpine, but the dark portions in the lower corners are Hudsonian and covered with small trees.

B. AN ARCTIC-ALPINE ROCK SLIDE.

A close view showing the characteristic vegetation of numerous kinds of small herbs, mostly with showy flowers. In many places in the park rocks break into thin flat slabs, which at high altitudes in level places are pressed down by the weight of the snow until they resemble carefully laid pavements.

A. FIR CLUBMOSS (LYCOPODIUM SELAGO).

In sphagnum at Johns Lake; about half natural size. This species grows more commonly above timber line. It does not have separate fruit spikes like those of the other species.



B. STIFF CLUBMOSS (LYCOPODIUM ANNOTINUM).

Nearly natural size. The only clubmoss common on both slopes of the park. The fruit spikes are not stalked.

A. RUNNING-PINE (LYCOPODIUM CLAVATUM).

Growing in the edge of a sphagnum bog at Johns Lake. About half natural size. Note the stalked fruit spikes.

B. QUEENCUP (CLINTONIA UNIFLORA).

Two-thirds natural size. Flowers white. One of the most abundant and attractive flowers of deep woods.

A. WESTERN YEW (TAXUS BREVIFOLIA).

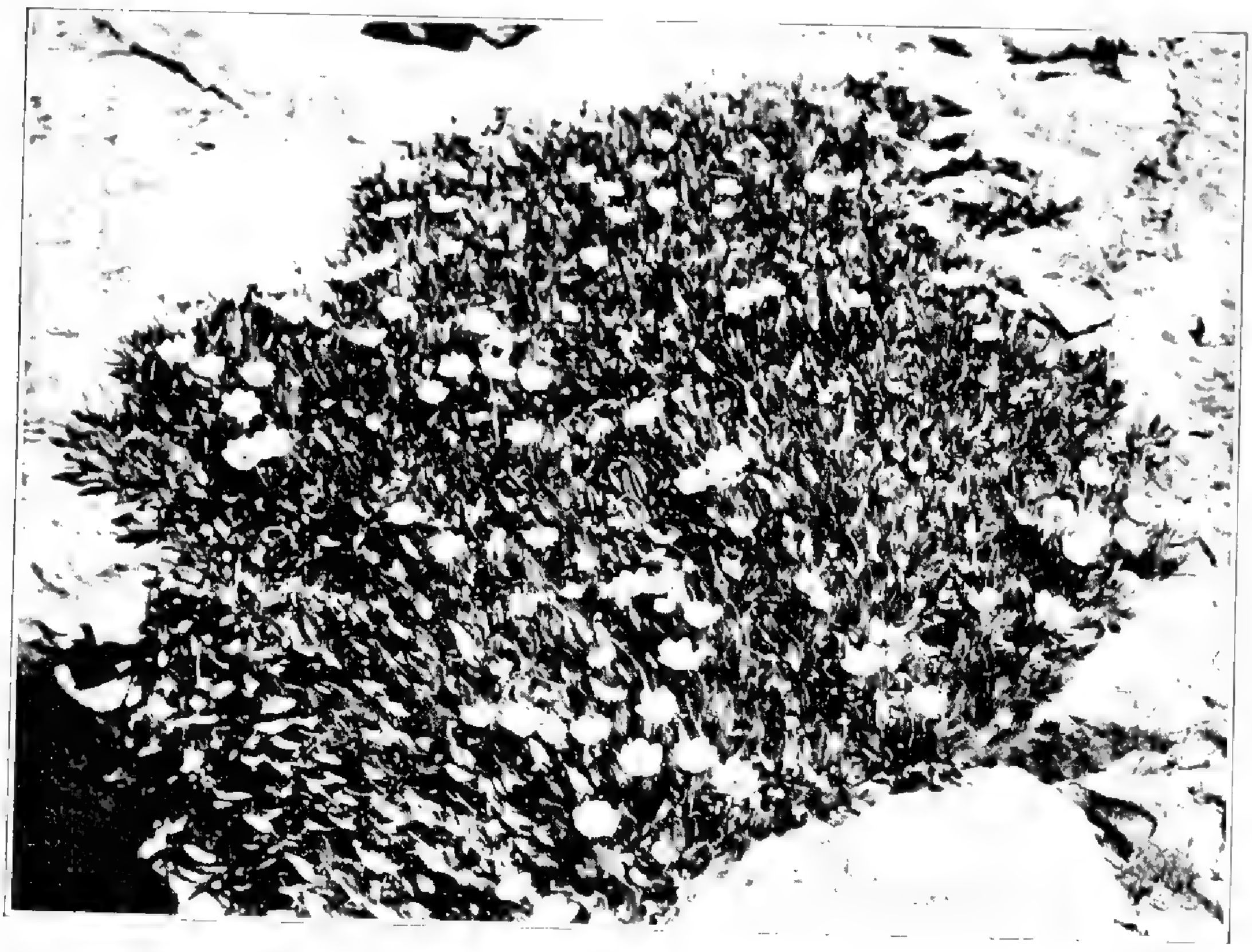
Half natural size. A common shrub of deep woods, found only on the west slope. Fruit red.

B. LADIES'-TRESSES (IBIDIUM ROMANZOFFIANUM).

Half natural size. Flowers white, sweet-scented. An attractive orchid, growing in wet places.

A. PURPLE CLEMATIS (CLEMATIS COLUMBIANA), IN FRUIT.

About half natural size. A woody vine growing at middle altitudes. Flowers with four large purple petal-like sepals.



B. WHITE DRYAD (DRYAS OCTOPETALA), ON ROCKS OF TRIPLE DIVIDE PEAK.

Flowers white, with eight petals. A common plant above timber line. Photograph by H. T. Cowling, from National Park Service.

A. ALPINE BISTORT (POLYGONUM VIVIPARUM).

About natural size. Flowers white, but usually replaced by green bulblets. Common above timber line

B. SPINY CURRANT (RIBES LACUSTRE).

About half natural size. Fruit nearly black, edible, but somewhat bitter, flowers green and purplish. A common shrub of the Hudsonian and Canadian zones.

A. RED RASPBERRY (RUBUS STRIGOSUS).

A dwarf form, growing on rock slides, shown here at about natural size. Six berries are visible on this plant. In favorable places the red raspberry is a meter high.

B. BLUE PHACELIA PHACELIA LYALLII.

About half natural size. Flowers purplish blue. A common and showy plant of rock slides.

A. CANADA BUFFALOBERRY (LEPARGYREA CANADENSIS).

Half natural size. Fruit bright red, showy, extremely bitter; flowers small and inconspicuous. A shrub, 0.5 to 1.5 meters high, found chiefly in the Canadian Zone.

B. COW PARSNIP (HERACLEUM LANATUM).

Flowers white; plants a meter high or taller. Often pointed out by the guides of the park as the "sacred rhubarb."

A. ROUGH ASTER (ASTER CONSPICUUS).

About half natural size. Flower heads with pale purple rays. Common at low and middle altitudes.

B. SHOWY FLEABANE (ERIGERON SALSUGINOSUS).

Plants 15 to 50 cm. high, the heads with pale purple rays. One of the

INDEX.

[Synonyms in italics.]

	Page.
Abies	275
Acer	375
Aceraceae	375
Achillea	432
Acomastylis	363
Acrolasia	378
Actaea	339
Adder's-tongue	311
family	263
Adenocaulon	430
Adiantum	265
Agoseris	415
Agropyron	293
Agrostis	284
Aira	286
Alder	325
Alisma	279
Alismaceae	279
Alkali blite	332
buttercup	341
Allium	311
Allocarya	401
Almond family	367
Alnus	325
Alopecurus	283
Alpine anemone	343
beardtongue	404
bistort	328
dandelion	416
fir	276
fireweed	380
forget-me-not	400
goldenrod	422
hawksbeard	418
hawkweed	419
larch	275
lousewort	410
poppy	344
speedwell	407
springbeauty	333
vegetation of Glacier Park	247
Alsike clover	369
Alsine	336
Alsinopsis	337
Althaea	376
Alumroot	355
Amaranthaceae	332
Amaranthus	332
Amarella	394
Ambrosia	430
Amelanchier	366
Ammiaceae	383
Amsinckia	400
Amygda'aceae	367
Anaphalis	429
Androsace	393
Anemone	343
Angelica	387
Anogra	382
Antennaria	427
Anticlea	310
Antiphylla	356
Apiaceae	383
Apinus	274
Apocynaceae	395
Apocynum	395
Apple family	366
Aquilegia	340
Arabis	350
Araceae	304
Aragallus	373
Aralia	383
Araliaceae	383
Arbor-vitae	276
Arctic-Alpine Zone in Glacier Park	247
Arctostaphylos	391
Arenaria	337
Argentina	361
Arnica	434
Arrowhead	279
Artemisia	432
Arum family	304
Asclepiadaceae	395
Asclepias	395
Aspen	318
Aspidium	268
Asplenium	266
Aster	423
family	419
golden	421
Asteraceae	419
Astragalus	370
Atelophragma	371, 372
Atenia	385
Athyrium	266
Atragene	339
Atriplex	330
Avena	287
Avens	363
Baby's-breath	411
Bailey, Vernon	252
Ball, C. R	253
Balsam fir	275
poplar, western	318
Balsamorrhiza	431
Balsamroot	431
Baneberry	339
Barbarea	348
Barberry family	344
Barley	280
grass	294
Basketgrass	309

	Page.
Bastard toadflax	323
Batrachium	341
Bean family	367
Bearberry	391
Beardtongue	404
Beargrass	309
Bearpaw	309
Beckmannia	287
Bedstraw	411
Beeplant, Rocky Mountain	352
Bentgrass	284
Berberidaceae	344
Berberis	344
Besseya	407
Betula	324
Betulaceae	324
Bilderdykia	328
Bindweed	396
Birch	324
canoe	325
family	324
scrub	324
water	325
western	325
Bistort	328
Bistorta	328
Bitter dock	329
Bittercress	348
Bittersweet family	375
Black cottonwood	318
hawthorn	366
raspberry	365
twinberry	413
Blackberry, cutleaf	364
Blackfoot Glacier	336
Indians, uses of plants	254
Bladder campion	334
Bladderpod	346
Bladderwort, yellow	410
Blanket-flower	432
Blite, alkali	332
strawberry	332
Blitum	332
Blue beardtongue	405
columbine	340
flag	314
gentian	394
phacelia	398
Bluebells	400
of Scotland	414
Blueberry, Canada	392
family	392
Blue-eyed grass	314
Bluegrass	288
annual	289
Canada	289
Kentucky	289
Bluelips	404
Bluestem, Colorado	293
Bog-asphodel	310
Bog-orchis	316
green	317
two-leaf	317
white	317
Boisduvalia	382
Borage family	399
Boraginaceae	399
Botrychium	263
Bracken	265
Brassica	348
Brassicaceae	344
Breadroot	333
Brickellia	421
Bristle fern	267
Brittle fern	268
Brome grass	292
Bromus	292
Bronzebells	309
Brooklime, American	407
Brown-eyed Susan	432
Bryanthus	390
Buckbean	395
family	395
Buckthorn	376
family	375
Buckwheat family	326
wild	328
Buffaloberry	378
Bulrush	295
Bunchberry	387
Bupleurum	384
Bur forget-me-not	399
snakeroot	384
Bur-reed	277
family	277
Bursa	346
Bush cinquefoil	360
Butter-and-eggs	404
Buttercup	341
alkali	341
creeping	342
family	338
water	341
Butterfly plant	382
Butterwort	410
family	410
Calamagrostis	285
Callitrichaceae	375
Callitriche	375
Calochortus	313
Calypso	316
Camas	312
death	310
poison	310
Camelina	346
Campanula	414
Campanulaceae	414
Campe	348
Campion, bladder	334
white	334
Canada blueberry	392
bluegrass	289
buffaloberry	378
thistle	438
violet	378
Canadian zone in Glacier Park	241
Canary grass	282
Candytuft, wild	346
Canoe birch	325
Caper family	352
Capnoides	344
Capparidaceae	352

	Page.
Caprifoliaceae	412
Capsella	346
Caraway	385
Cardamine	348
Carex	296
aenea	300
albo-nigra	303
arcta	301
athrostachya	300
atrosquama	303
aurea	302
bebbii	300
buxbaumii	302
canescens	301
capillaris	302
chalciolepis	303
diandra	300
disperma	301
douglasii	299
festivella	301
filifolia	301
flava	304
geyeri	301
gynocrates	299
halleri	303
hepburnii	299
hoodii	300
interior	300
kelloggii	303
lachenalii	301
laeviculmis	300
lanuginosa	303
lasiocarpa	303
leptalea	301
leptopoda	300
limosa	302
marcida	299
mertensii	303
miliaris	304
nebraskensis	303
nigricans	299
nubicola	301
pachystachya	301
parryana	302
phaeocephala	300
piperi	300
podocarpa	302
praegracilis	299
praticola	300
preslii	301
pyrenaica	299
raynoldsii	302
rossii	302
rostrata	304
sartwellii	300
scirpoidea	302
substricta	303
tolmiei	302
vesicaria	304
viridula	304
Carnation	333
Carpenter-weed	402
Carpet pink	334
vervain	401
Carrot	383
Carum	385
Caryophyllaceae	333
Cascara sagrada	376
Castilleja	408
Catabrosa	287
Catchfly	334
Catnip	403
Cat-tail	277
family	277
Ceanothus	376
Cedar, creeping	277
giant	276
western red	277
Celastraceae	375
Celery	383
Cerastium	335
Chaetochloa	282
Chalice-flower	343
Chamaenerion	380
Chamaepericlimenum	388
Chamaesyce	374
Chamomilla	432
Charlock	348
Chase, Agnes	253
Cheat	292
Checkerberry	391
Cheilanthes	266
Cheirinia	348
Chenopodiaceae	330
Chenopodium	331
Cherry	367
Chess	292
Chickweed	335
common	336
mouse-ear	335
Chicory family	414
Chimaphila	388
Chokecherry	367
Chrysanthemum	432
Chrysopsis	421
Cichoriaceae	414
Cicuta	385
Cinna	284
Cinquefoil	359
bush	360
Circaea	379
Cirsium	438
Claytonia	333
Clematis	339
Cleome	352
Cliffbrake	265
Clintonia	312
Clover	369
Clubmoss	270
family	270
fir	271
stiff	271
Coeloglossum	317
Cogswellia	386
Coleosanthus	421
Collinsia	404
Collomia	397
Colorado bluestem	293
Coltsfoot, sweet	434
Columbine	340
Comandra	326
Comarum	361

	Page.
Compositae	419
Conringia	348
Convolvulaceae	396
Convolvulus	396
Corallorhiza	315
Coralroot	315
Corn	280
Cornaceae	387
Cornus	387
Corpse-plant	389
Corydalis	344
Cotton	376
Cottongrass	295
Cottonweed	379
Cottonwood, black	318
Cow parsnip	386
Cow-wheat	410
Cranberry, highbush	412
Crane's-bill	374
Crassulaceae	352
Crataegus	366
Creeping cedar	277
spurge	374
wintergreen	391
Crepis	417
Crested shieldfern	268
Cruciferae	344
Cryptantha	400
Cryptogramma	265
Cudweed	430
Currant, spiny	357
sticky	357
Cyclachaena	430
Cyperaceae	294
Cystopteris	268
Cytherea	316
Daffodil	308
Daisy fleabane	427
ox-eye	432
Dandelion	416
false	415
Danthonia	287
Dasiphora	360
Dasystephana	394
Death camas	310
Deerbrush	376
Delphinium	339
Deschampsia	286
Devil's-club	383
Dill	383
Diplotaxis	347
Disporum	313
Distegia	413
Distichlis	288
Dock	329
bitter	329
golden	329
mountain	330
pale	329
sour	330
yellow	329
Dodecatheon	393
Dogbane	395
family	395
Dog-tooth violet	311
Dogwood family	387
flowering	388
red-osier	387
Dondia	331
Double bladderpod	346
Douglas fir	276
spruce	276
Draba	349
Dragonhead	402
Drosera	352
Droseraceae	352
Dryad	362
Dryas	362
Drymocallis	362
Dryopteris	267
Duckweed	304
Dulichium	295
Echinopanax	383
Edelweiss	430
Elaeagnaceae	378
Elaeagnus	378
Elderberry	412
Eleocharis	295
Elephantella	410
Elephanthead	409
Elrod, M. J.	252
Elymus	294
Emery, Roe	253
Enchanter's nightshade	379
Engelmann spruce	275
Epilobium	379
Epipactis	316
Equisetaceae	268
Equisetum	268
Erica	391
Ericaceae	390
Erigeron	425
Eriogonum	326
Eriophorum	295
Eritrichum	400
Erxlebena	389
Erysimum	348
Erythronium	311
Eucephalus	423
Euphorbia	374
Euphorbiaceae	374
Evening-primrose	382
family	378
prairie	381
Everlasting, pearly	429
Fabaceae	367
Fairybells	313
False dandelion	415
flax	346
hellebore	310
Fanweed	345
Fatsia	383
Fern, bristle	267
brittle	268
holly	267
lace	266
male	268
oak	267
parsley	265
pod	266
wood	268
Fescue	291
Festuca	291
Fiddleneck	400
Figwort family	403

Page.

Filix 268
Fir 275
alpine 276
Douglas 276
red 276
Fireweed 380
Fish Lake, flora of 245
Flag, blue 314
Flax 374
false 346
family 374
wild 374
Fleabane 425
cutleaf 426
daisy 427
showy 427
white 426
Forget-me-not 400
alpine 400
bur 399
Foxtail, green 282
marsh 283
Fragaria 362
Fringed parnassia 353
Fritillaria 314
Fumariaceae 344
Fumitory family 344
Gaillardia 432
Galium 411
Garden Wall 235
Garlic 311
Gaultheria 391
Gaura 382
Gaylussacia 392
Gayophytum 382
Gentian 394
blue 394
family 394
Gentiana 394
Gentianaceae 394
Geraniaceae 374
Geranium 374
family 374
Geum 363
Ghost-plant 389
Ghost's lariat 339
Giant cedar 276
Gilia 397
Ginseng 383
family 383
Glacier lily 311
Glacier National Park, animals 236
area 235
bibliography 253
botanical exploration of 249, 251
forests 237
general features of flora 236
geology 235
hepatics 254
introduced species 237
lichens 254
life zones 238
map 239
mosses 254
number of species of plants represented . 249
relationships of flora 237

Page.

Globeflower 340
Glyceria 290
Glycosma 385
Glycyrrhiza 370
Gnaphalium 430
Golden aster 421
dock 329
Goldenrod 422
Gooseberry family 357
wild 358
Goosefoot family 330
Grape, Oregon 344
Grapefern 264
Graphephorum 286
Grass, barley 294
canary 282
family 280
holy 282
onion 288
porcupine 282
Seneca 282
slough 287
tickle 284
vanilla 282
Gratiola 406
Gray hedysarum 370
rockcress 351
Green alder 325
foxtail 282
spleenwort 266
Griffiths, David 252
Grindelia 421
Grossularia 358
Grossulariaceae 357
Ground juniper 277
Ground-cedar 271
Ground-pine 271
Gum-plant 421
Habenaria 316
Hairgrass 286
Halerpestes 341
Haloragidaceae 382
Harebell 414
family 414
Hare's-ear mustard 348
Hawksbeard 417
Hawkweed 418
Hawthorn, black 366
Heal-all 402
Heath family 390
Heather, red 390
white 391
Hedge-nettle 403
Hedysarum 370
Helianthus 431
Heliotrope, wild 412
Hellebore 311
false 310
Helleborine 316
Hemieva 354
Hemlock, water 386
western 276
Hemp, Indian 395
Hepatics of Glacier Park 254
Heracleum 386
Heterisia 357

	Page.
Heuchera	355
Hibiscus	376
Hieracium	418
Hierochloa	282
Highbush cranberry	412
Hippuris	383
Hitchcock, A. S	252
Holly fern	267
Hollyhock	376
wild	376
Holy grass	282
Holzinger, J. M	251
Homalobus	371, 372
Honeysuckle family	412
Hop clover	369
Hordeum	294
Horehound, water	402
Horned pondweed	278
Horsemint	402
Horsetail	268
family	268
Horseweed	426
Huckleberry	392
Hudsonian Zone in Glacier Park	245
Hyacinth	308
Hydrophyllaceae	397
Hydrophyllum	398
Hymenoxys	431
Hypericaceae	376
Hypericum	376
Hypopitys	390
Ibidium	316
Indian hemp	395
mustard	348
paintbrush	408
warrior	410
Indian-pipe	389
family	389
Iridaceae	314
Iris	314
family	314
Iva	430
Jack, J. G	252
Jacob's-ladder	396
Jerusalem oak	331
Jim Hill weed	346
Johns Lake, flora of	245
Jones, M. E	252
Juncaceae	305
Juncoides	307
Juncus	305
Juneberry	367
Junegrass	287
Juniper, ground	277
Juniperus	277
Kalmia	390
Kentucky bluegrass	289
Kinnikinnick	391
Kittentails	407
Knotweed	328
tall	329
Koeleria	287
Labrador tea	391
Lace fern	266
Laceflower	355
Lactuca	416

	Page.
Lady fern	266
Lady's-tresses	316
Lakes of Glacier Park	244, 245
Lamb's-quarters	332
Lange, E. F	252
Lappula	399
Larch	275
Larix	275
Larkspur	339
Lathyrus	373
Laurel, mountain	390
Rocky Mountain	390
Lavauxia	381
Leatherleaf saxifrage	355
Ledum	391
Leek	311
Leguminosae	367
Lemnaceae	304
Leontodon	416
Lepargyrea	378
Lepidium	345
Leptarrhena	355
Leptasea	356
Leptilon	426
Leptotaenia	387
Lesquerella	346
Lettuce	416
prickly	417
Lewis, J. E	253
Lichens of Glacier Park	254
Licorice, wild	370
Liliaceae	308
Lily family	308
glacier	311
mariposa	313
Limber pine	274
Limnobotrya	357
Limnorchis	317
Limosella	406
Linaceae	374
Linanthus	397
Linaria	404
Linnaea	412
Linum	374
Listera	315
Lithophragma	354
Lithospermum	400
Loasa family	378
Loasaceae	378
Locoweed	372
Lodgepole pine	274
Lonicera	413
Loranthaceae	438
Lousewort, alpine	410
Lupine	368
Lupinus	368
Lychnis	334
Lycopodiaceae	270
Lycopodium	270
Lycopus	402
Lysias	317
Lysichiton	304
Lysiella	316
Mackenzie, K. K	253
Madder family	411
Madia	431

	Page.
Maidenhair	265
Malaceae	366
Male fern	268
Mallow family	376
Malvaceae	376
Maple	375
family	375
Mare's-tail	383
Mariposa lily	313
Marsh foxtail	283
violet	377
Marshlocks	361
Matricaria	432
Meadow parsnip	384
Meadow-rue	342
Meadowsweet, pink	359
white	359
Melampyrum	410
Melica	288
Melilotus	370
Mentha	402
Menthaceae	401
Mentzelia	378
Menyanthaceae	395
Menyanthes	395
Menziesia	391
Mertensia	400
Micranthes	357
Microseris	417
Microsteris	397
Milkvetch	370
Milkweed	395
family	395
Mimulus	405
Mint, American	402
family	401
Mistletoe family	438
Mistmaiden	398
Mitella	354
Miterwort	354
Moehringia	337
Moldavica	402
Monarda	402
Moneses	388
Monkeyflower	405
Monolepis	331
Monotropa	389
Monotropaceae	389
Montiastrum	333
Moonwort	263
Mormon biscuit	431
Morning-glory family	396
Mosses of Glacier Park	254
Moth mullen	404
Mountain alder	325
dock	330
laurel	390
lover	375
maple	375
rice	283
sorrel	333
timothy	283
Mountain-ash	366
Mountain-spray	359
Mouse-ear chickweed	335
Mousetail	341
Mudwort	406
Muhlenbergia	283
Mullen	404
Muscaria	356
Muskflower	406
Mustard	348
family	344
hare's-ear	348
Indian	348
tansy	347
tumble	347
Myosotis	400
Myosurus	341
Myriophyllum	382
Nabalus	419
Naiocrene	333
Navarretia	396
Nemophila	398
Nepeta	403
Nettle	326
family	326
New Jersey tea	376
Nightshade, enchanter's	379
Ninebark	359
Noble, H. A	253
Norta	347
Norton, Miss G. P	252, 253
Nymphaea	338
Nymphaeaceae	338
Oak fern	267
Oats	287
Ochrocodon	314
Oenothera	381, 382
Okra	376
Oleaster family	378
Onagraceae	378
Onion	311
grass	288
Ophioglossaceae	263
Ophrys	315
Opulaster	359
Orchidaceae	314
Orchis family	314
Oregon grape	344
Oreobroma	333
Oreocarya	401
Orthocarpus	409
Oryzopsis	283
Osmorrhiza	384
Owl-clover	409
Ox-eye daisy	432
Oxyria	330
Oxytropis	372
Ozomelis	354
Orpine, red	352
Pachistima	375
Pachylophus	381
Paintbrush, Indian	408
Panax	383
Panicularia	290
Papaver	344
Papaveraceae	344
Parnassia	353
family	353

	Page.
Parnassiaceae	353
Parsley family	383
fern	265
Parsnip	386
cow	386
meadow	384
water	385
Pasque-flower	343
Pastinaca	386
Pathfinder	430
Payne, W. W	253
Pea, yellow	369
Peachleaf willow	320
Pear	366
Pearlwort	336
Pearly everlasting	429
Pectianthia	354
Pedicularis	409
Pellaea	266
Pemmican	367
Pentstemon	404
Peppergrass	345
Peramium	316
Peritoma	352
Persicaria	328
Petasites	434
Phaca	372
Phacelia	398
Phalaris	282
Phegopteris	267
Phleum	283
Phlox	397
family	396
Phyllodoce	390
Physaria	346
Physocarpus	359
Picea	275
Pigweed	332
family	332
Pin cherry	367
Pinaceae	273
Pincushion plant	396
Pine	273
family	273
limber	274
lodgepole	274
western white	274
western yellow	273
whitebark	274
Pineapple-weed	432
Pinedrops	390
Pinesap	390
Pinguicula	410
Pinguiculaceae	410
Pink aster	423
carpet	334
corydalis	344
dogbane	395
family	333
meadowsweet	359
pyrola	389
Pinus	273
Piperia	317
Pipsissewa	388
Plantaginaceae	411
Plantago	411
Plantain	411
family	411
Plum	367
Poa	288
Poaceae	280
Pod fern	266
Poison camas	310
Polemoniaceae	396
Polemonium	396
Polygonaceae	326
Polygonum	327
Polypodiaceae	264
Polypodium	265
Polypody family	264
western	265
Polystichum	267
Pondlily, yellow	338
Pondweed	278
family	278
horned	278
Poplar, western balsam	318
Poppy	344
family	344
Populus	317
Porcupine grass	282
Portulacaceae	332
Potamogeton	278
Potamogetonaceae	278
Potentilla	359
Poverty-weed	331
Prairie gentian	394
Prenanthes	419
Prickly lettuce	417
Primrose family	393
Primulaceae	393
Prune	367
Prunella	402
Prunus	367
Pseudotsuga	276
Pteridium	265
Pterospora	390
Ptilocalais	417
Puccinellia	290
Puccoon	400
Pulsatilla	343
Purple avens	363
clematis	339
geranium	374
hedysarum	370
onion	311
rockcress	351
saxifrage	356
violet	377
Purslane family	332
speedwell	407
Pussytoes	427
Pyrola	388
family	388
Pyrolaceae	388
Pyrrocoma	422
Quaking aspen	318
Quamasia	312
Queencup	312
Quince	366
Radicula	346
Ragweed	430

	Page.
Ragwort	436
Ramischia	389
Ranunculaceae	338
Ranunculus	341
Raspberry, black	365
red	364
Rattle, yellow	410
Rattlesnake plantain	316
Rattlesnake root	419
Razoumofskya	438
Red cedar	277
clover	369
fir	276
heather	390
monkeyflower	406
orpine	352
raspberry	364
twinberry	413
Red-osier dogwood	387
Redstem saxifrage	357
Reedgrass	284, 285
Resurrection plant	272
Rhamnaceae	375
Rhamnus	376
Rhinanthus	410
Rhodiola	352
Rhubarb, sacred	386
Ribes	357
Rice, mountain	283
Rock slides, flora of	248
Rockcress	350
gray	351
purple	351
Rocky Mountain beeplant	352
laurel	390
Romanzoffia	398
Rosa	365
Rosaceae	358
Rose	365
family	358
Rubacer	364
Rubiaceae	411
Rubus	364
Rumex	329
Running-pine	271
Rush	305
family	305
toad	306
Russian thistle	331
Rye	280
Rye, wild	294
Sabina	277
Sacred rhubarb	386
Sagebrush	433
Sageleaf willow	322
Segina	336
Sagittaria	279
St. John's-wort	376
family	376
Salicaceae	317
Salix	319
amygdaloides	320
anglorum	322
barrattiana	321
bebbiana	323
brachycarpa	322

	Page.
Salix candida	322
cascadensis	324
caudata	320
commutata	321
drummondiana	323
exigua	321
farrae	321
geyeriana	323
glauca	322
glaucops	322
interior	320
longifolia	321
mackenziana	321
melanopsis	321
nivalis	324
petrophila	322
pseudolapponum	322
pseudomonticola	321
pseudomyrsinites	321
saximontana	324
scouleriana	323
serissima	320
stricta	322
subcoerulea	323
tenera	324
vestita	324
Salsola	331
Saltgrass	288
Sambucus	412
Sandalwood family	326
Sandbar willow	320
Sandwort	337
Sanicula	384
Santalaceae	326
Sarsaparilla, wild	383
Savastana	282
Saxifraga	355
Saxifragaceae	353
Saxifrage	355
family	353
leatherleaf	355
purple	356
redstem	357
Schaffner, J. H	253
Scheuchzeria	279
family	279
Scheuchzeriaceae	279
Scirpus	295
Scouring-rush	268
Scrophulariaceae	403
Scrub birch	324
Sedge	296
family	294
Sedum	352
Selaginella	271
family	271
Selaginellaceae	271
Self-heal	402
Seneca grass	282
Senecio	436
Serapias	316
Sericotheca	359
Serviceberry	366
Shadbush	367
Sheep sorrel	330
Shepherdia	378

	Page.
Shepherd's-purse	346
Shieldfern, crested	268
Showy fleabane	427
Sibbaldia	362
Sieversia	363
Silenaceae	333
Silene	334
Silverberry	378
Silver-plant	327
Silverweed	361
Sinapis	348
Sisymbrium	347
Sisyrinchium	314
Sium	385
Skunkberry	413
Skunkcabbage	304
Skunk-plant	396
Slough grass	287
Smartweed, water	328
Smelowskia	346
Smilacina	312
Smilax	383
Snakeroot, bur	384
Snowberry	413
Snowbrush	376
Solidago	422
Solomon's-seal, false	312
Somes, M. P	252
Sonchus	417
Sophia	347
Sorbus	366
Sorrel, mountain	330
Sour dock	330
Sow thistle	417
Sparganiaceae	277
Sparganium	277
Spathyema	304
Spatularia	357
Speedwell	407
Sphaeralcea	376
Sphagnum bogs of Glacier Park	245
Spikerush	295
Spiny currant	357
Spiraea	359
Spiranthes	316
Spleenwort, green	266
Spotted pyrola	389
Springbeauty	333
Spruce	275
Douglas	276
Spurge, creeping	374
family	374
Squawgrass	309
Squirreltail	294
Stachys	403
Standley, P. C., field work in Glacier Park	249
Starwort, water	375
Stellaria	335
Stenanthella	309
Stenanthium	309
Stickleaf	378
Stickseed	400
Sticky currant	357
Stipa	282
Stonecrop	352
family	352
yellow	353
Strawberry	362
blite	332
Streptopus	313
Strobus	274
Suaeda	331
Suksdorfia	355
Sulphur-plant	327
Sundew family	352
Sunflower	431
Svida	387
Sweet cicely	384
coltsfoot	434
Sweetclover, yellow	370
Sweetgrass	282
Sweet-scented bedstraw	411
Symphoricarpos	413
Synthyris	407
Tamarack	275
Tansy mustard	347
Taraxacum	416
Taraxia	381
Tarweed	431
Taxaceae	272
Taxus	272
Thalictrum	342
Thelypteris	267
Thermopsis	369
Thimbleberry	364
Thistle	438
Russian	331
Thlaspi	345
Thompson, Mrs. Otto	252
Thuja	276
Thyme-leaf speedwell	407
Tiarella	355
Tickle grass	284
Timothy	283
Tium	371, 372
Toad rush	306
Toadflax, bastard	326
Tofieldia	310
Torresia	282
Townsendia	423
Toxicoscordion	310
Transition Zone in Glacier Park	239
Trifolium	369
Trillium	314
Trisetum	286
Triticum	293
Trollius	340
Troximon	415
Tsuga	276
Tumble mustard	347
Tumbleweed	331, 332
Turritis	352
Twayblade	315
Twinberry	413
Twinflower	412
Twisted-stalk	313
Typha	277
Typhaceae	277
Ulke, Titus	252
Umbach, L. M	251
Umbelliferae	383
Umbrella-plant	327
Urtica	326
Urticaceae	326

	Page.
Utricularia	410
Vacciniaceae	392
Vaccinium	292
Vagnera	312
Valerian	413
family	413
Valerianaceae	413
Vanilla grass	282
Venus'-slipper	316
Veratrum	310
Verbascum	404
Verbena	401
Verbenaceae	401
Veronica	407
Vervain	401
Vetch	373
Vetchling	373
Viburnum	412
Vicia	373
Viola	377
Violaceae	377
Violet	377
dog-tooth	311
Vreeland, F. K	252
Wahlbergella	334
Wake-robin	314
Wallflower, wild	348
Water birch	325
buttercup	341
hemlock	386
horehound	402
milfoil	382
family	382
parsnip	385
smartweed	328
starwort	375
family	375
Waterleaf	398
family	397
Waterlily family	338
Waterplantain	279
family	279
Weller, Stuart	252
Wheat	293
Wheatgrass	293
White angelica	387
campion	334
clematis	339
clover	369
dryad	363
fleabane	426
geranium	374
hawkweed	418
heather	391
meadowsweet	359
phacelia	398
pine	274
spruce	275
thistle	438
Whitebark pine	274
Whitlowgrass	349
Whortleberry	392, 393
Wild buckwheat	328
candytuft	346
flax	374
gooseberry	358
heliotrope	412
hollyhock	376
licorice	370
rye	294
sarsaparilla	383
wallflower	348
Williams, R. S	251
Willow	319
family	317
peachleaf	320
sageleaf	322
sandbar	320
Wintercress	348
Wintergreen	388, 391
creeping	391
Wokas	338
Wood fern	268
Woodland star	354
Wood-nymph	388
Woodrush	307
Woodsia	268
Wormwood	432
Xerophyllum	309
Xylophacos	372
Xylosteon	413
Yampa	385
Yarrow	432
Yellow angelica	387
avens	363
beardtongue	405
bladderwort	410
columbine	340
corydalis	344
dock	329
dryad	363
hedysarum	370
monkeyflower	406
pea	369
pine	273
pondlily	338
rattle	410
stonecrop	353
sweetclover	370
violet	377
Yellow-bell	314
Yelloweress	346
Yew family	272
western	272
Youngia	417, 418
Zannichellia	278
Zizia	384
Zygadenus	310

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GRASSES OF BRITISH GUIANA

By A. S. HITCHCOCK

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CONTENTS.

	Page.
Introduction	439
Descriptive list, with keys	447
List of new species and new names	515
Index	vii

ILLUSTRATIONS.

PLATE.

	Facing page.
PLATE 53. Map of British Guiana	439

TEXT FIGURES.

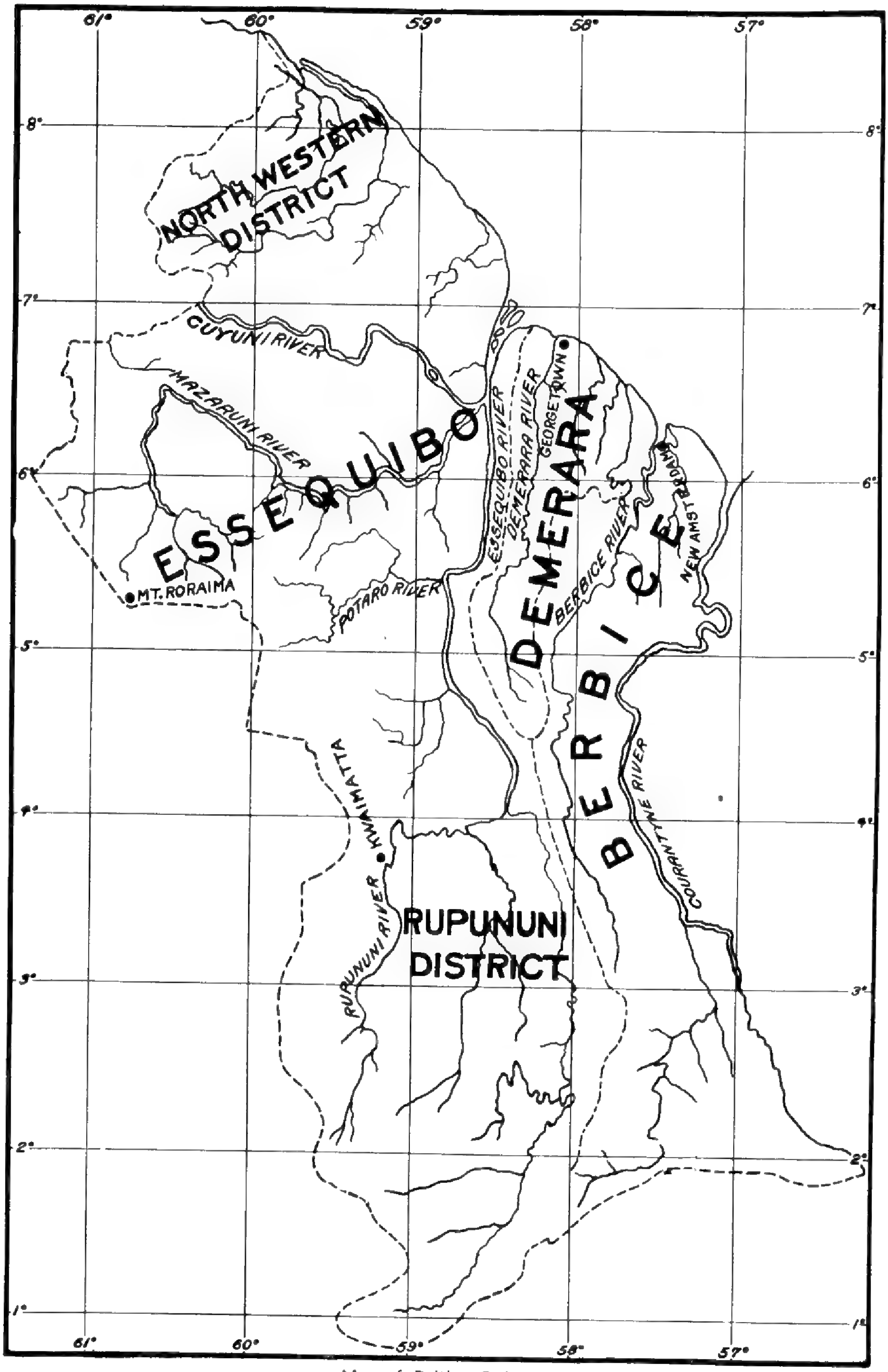
	Page.
FIGURE 77. Northern part of British Guiana	440
78. *Eragrostis guianensis*	455
79. *Syntherisma malacophylla*	467
80. *Axonopus stragulus*	473
81. *Paspalum abrahami*	481
82. *Panicum luticola*	486
83. *Panicum guianense*	488
84. *Panicum magnum*	490
85. *Panicum errabundum*	495
86. *Manisuris guianensis*	511

PREFACE.

The accompanying paper by Dr. A. S. Hitchcock, systematic agrostologist of the United States Department of Agriculture, is an account of the grasses of British Guiana. It contains a descriptive list of the species, keys to the tribes and genera, a discussion of the distribution of the species according to habitat, and notes on their economic uses. Ten new species are described and all but one illustrated.

The flora is related on the one hand to that of Brazil and on the other to that of the West Indies. A few montane species are found in the region of the famous table mountain, Roraima, but in the main the species are those of the tropical lowlands. The savanna grasses of the southern part of the Colony furnish the basis of an important stock industry.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.



Map of British Guiana.

GRASSES OF BRITISH GUIANA.

By A. S. Hitchcock.

INTRODUCTION.

In the fall of 1919 I visited British Guiana for the purpose of collecting and studying its flora, especially the grasses. The itinerary has been recorded [1] in another place and a brief account of the country and its botanical aspects has also appeared. [2]

The collection of grasses obtained seemed sufficiently representative to warrant the preparation of an account of the grass flora of the Colony. The following paper is based on this collection and also on an important Colonial collection, the Jenman Herbarium. Professor J. B. Harrison, Director of Science and Agriculture, British Guiana, very kindly placed the herbarium at my disposal and allowed me to select for the U. S. National Herbarium a set of duplicates of the grasses.

The Jenman Herbarium is arranged in suitable cases in the office of the Director at the Botanic Gardens, Georgetown. Most of the specimens were collected by Jenman, but there are also collections from Roraima by Im Thurn, and by McConnell and Quelch, and from various parts of the Colony by Bartlett, Stockdale, and occasionally others, all connected at some time with the Department of Science and Agriculture. Mr. G. S. Jenman was the Director of the Botanic Garden for many years. Recently an important collection has been made by Abraham in connection with the cattle trail survey in County Berbice. Before the collections made by the writer were incorporated, there were comparatively few specimens from British Guiana in the U. S. National Herbarium, the most important set being one collected by Schomburgk.

The present list of grasses includes 169 species, nine of which are described as new. The synonymy has been limited to the more important names. Many of the species are also found in the West Indies and a more complete synonymy is included in a recent work dealing with the grasses of that region.[3] Most of the remaining

[1] Journ. N. Y. Bot. Gard. **21**: 129–137. 1920.

[2] Floral Aspects of British Guiana, Ann. Rep. Smiths. Inst. **1919**: 293–305. 1921.

[3] Grasses of the West Indies, Contr. U. S. Nat. Herb. **18**: 261–471. 1917.

species are described in Martius's Flora of Brazil,[4] where synonymy is given.

In the article on the Floral Aspects of British Guiana, cited above, the climatic and topographic features of the country are described.

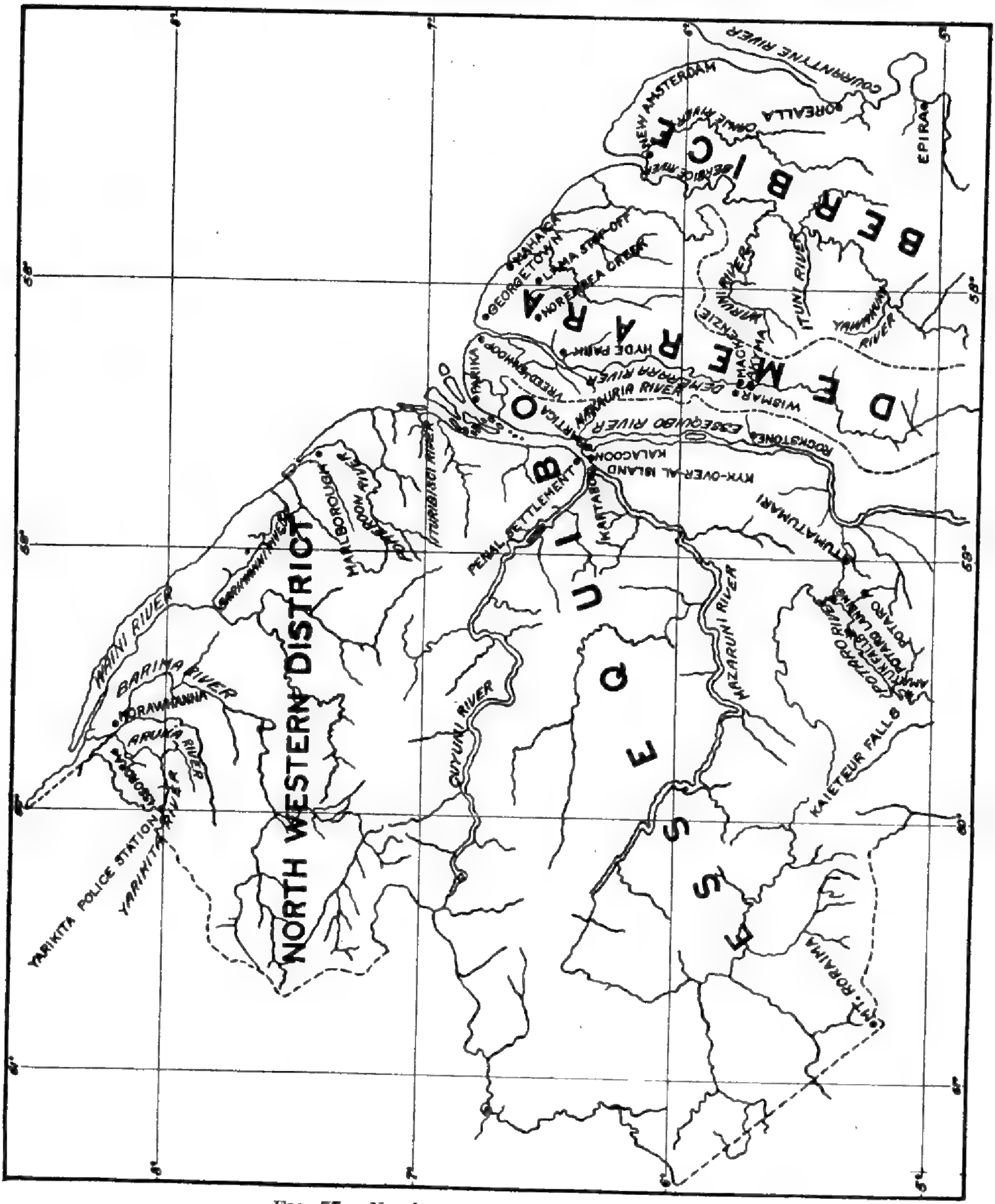


FIG. 77.—Northern part of British Guiana.

A short résumé here will suffice. From the northern coast line of about 270 miles the Colony extends southward 540 miles on the west-

[4] Doell in Mart. Fl. Bras. Vol. 2^2 and 2^3 (Andropogoneae and Tristegineae by Hackel.)

ern and 300 miles on the eastern side. Along the coast is a belt 10 to 40 miles wide of low, more or less swampy land, covered with forest, with interspersed areas of marshy savannas. Back of this is a broad belt of undulating forest-covered land reaching a maximum elevation of possibly 200 feet. Toward the southwest there is a series of plateaus, also forest-covered, culminating in a range of mountains extending into British Guiana from Venezuela. Here is the famous table mountain, Roraima, rising from the plateau level of 1,050 meters to a height of 2,580 meters. The sides are precipitous and the flat summit of several miles' area is inaccessible except by a shelving ascent on one side.[5]

Most of British Guiana is covered by virgin forest. Only in the south, the Rupununi District, are there extensive upland savannas, an extension eastward of the vast savannas of Venezuela.

Of the 169 species included in the present list 33, or about 20 per cent, are introduced, the greater proportion of these being in the vicinity of settlements. The following are the introduced species:

Eragrostis amabilis. Frequent in gardens.
Eragrostis ciliaris. Infrequent; waste places.
Eragrostis pilosa. Rare.
Eragrostis tephrosanthos. Common in gardens.
Arundo donax. Escaped from cultivation; abundant locally.
Leptochloa filiformis. Frequent in gardens.
Eleusine indica. Common.
Dactyloctenium aegyptium. Rare.
Capriola dactylon. Bahama grass; common.
Chloris radiata. Rare.
Bouteloua americana. Rare.
Valota insularis. Rare.
Syntherisma sanguinalis. Common.
Syntherisma digitata. Common.
Syntherisma chinensis. Common.
Syntherisma longiflora. Rare.
Eriochloa ramosa. Common around Georgetown.
Paspalum fimbriatum. Rare.
Paspalum paniculatum. Infrequent.
Panicum reptans. Infrequent in gardens.
Panicum maximum. Guinea grass; escaped from cultivation; infrequent.

---

[5] See Trans. Linn. Soc. II. Bot. 6: 2. 1901. The dates of expeditions to Roraima are here given: R. H. Schomburgk, 1838; R. H. and Richard Schomburgk, 1842; Karl Appun, 1864; C. B. Brown and J. G. Sawkins, 1869; J. W. Boddam-Whetham and M. McTurk, 1878; D. Burke, 1881; Siedel, 1884; E. F. Im Thurn and H. I. Perkins, 1884, reaching the summit for the first time; E. Kromer, 1886; Dressel, 1887; F. V. McConnell and J. J. Quelch, 1894 and 1898. Ule made the ascent in 1909.

Panicum barbinode. Pará grass; escaped from cultivation; common.
Echinochloa colonum. Common.
Cenchrus echinatus. Common in grassland and waste places.
Andropogon pertusus panormitanus. This and the following three in grassland of the Botanical Garden:
Andropogon nodosus.
Andropogon annulatus.
Andropogon ischaemum.
Anatherum zizanioides. Khuskhus, vetiver; escaped from cultivation.
Holcus sorghum. Escaped from cultivation; rare.
Holcus sorghum sudanensis. Escaped from cultivation; rare.
Ischaemum ciliare. Frequent inland.
Coix lachryma-jobi. Escaped from cultivation; infrequent.

There are but two distinctly seacoast species, *Sporobolus virginicus* and *Spartina brasiliensis.* A few species are characteristic of sandy soil. An example of sand barrens is found between the Demerara and Essequibo rivers, a section of which is accessible along the railroad between Wismar and Rockstone. This region is similar to the white sand scrub of central Florida. The vegetation is mainly shrubs and small trees with areas of bare white sand between. The characteristic grasses here are *Axonopus attenuatus*, *Gymnopogon foliosus*, and *Paspalum arenarium.* In the sandy savanna back of the East Coast Water Conservancy at the head of Horeabea Creek *Panicum micranthum* was abundant.

The coast savannas, which are open marshy areas, harbor many species of grasses. There is considerable variation in the amount of water in different parts of this coastal area, this affecting the distribution of the grasses. The following is a list of the species found chiefly in the moist or moderately dry parts of the savannas of the coast, but not normally in the ditches and other wet parts of the region:

Gynerium sagittatum. A giant reed. There is a patch near the station at Parika. Infrequent.
Leptochloa scabra. Along ditches. Infrequent.
Leptochloa virgata. Brushy land. Common.
Sporobolus indicus. Common on grassy hills of Central America and the West Indies; found in grassland about Georgetown, possibly introduced here.
Valota laxa. Moist soil. Infrequent.
Stenotaphrum secundatum. Infrequent. In the United States called St. Augustine grass.
Eriochloa subglabra. Rare.
Eriochloa punctata. Common.

Axonopus leptostachyus. Frequent in the vicinity of Bartica.
Paspalum densum. Frequent in marshes.
Paspalum millegrana. Infrequent.
Paspalum virgatum. Common.
Paspalum conjugatum. Sourgrass; common.
Panicum laxum. Common.
Panicum milleflorum. Infrequent, mostly in rather wet places.
Panicum pilosum. Common.
Panicum zizanioides. Frequent.
Panicum glutinosum. Rare.
Panicum altum. Infrequent.
Panicum hirsutum. Rare.
Panicum errabundum. Rare.
Panicum polycomum. Rare.
Panicum parvifolium. Frequent.
Panicum cyanescens. Infrequent.
Panicum nervosum. Rare.
Sacciolepis myuros. Infrequent.
Homolepis isocalycia. Rare.
Isachne polygonoides. Rare.
Echinochloa crusgalli crus-pavonis. Infrequent.
Chaetochloa geniculata. Common in grassland
Imperata brasiliensis. Infrequent.
Imperata contracta. Infrequent.
Andropogon bicornis. Common.
Eriochrysis cayennensis. Rare.
Manisuris guianensis. Rare.
Ischaemum guianense. Infrequent.

There are several grasses of the coastal region that are found more particularly in or near the water. Two of these (*Paspalum repens* and *Panicum elephantipes*) grow in rather deep water, with the foliage often floating on the surface. These often form the basis of floating islands in the rivers. The others are:

Homalocenchrus hexandrus. Common.
Luziola spruceana. Frequent.
Paspalum distichum. Common.
Paspalum vaginatum. Common.
Paspalum orbiculatum. Infrequent.
Panicum geminatum. Common.
Panicum frondescens. Frequent.
Panicum luticola. Rare.
Panicum polygonatum. Rare.
Panicum guianense. Rare.
Panicum megiston. Infrequent.
Sacciolepis striata. Infrequent.

Hymenachne amplexicaulis. Frequent.
Hymenachne auriculata. Frequent.
Echinochloa polystachya. Infrequent.

The flora changes somewhat in the intermediate region back of the coastal belt. On open sandy land here one finds:

Eragrostis maypurensis. Infrequent.
Eragrostis guianensis. Rare.
Sporobolus ciliatus. Infrequent.
Sporobolus aeneus. Infrequent.
Aristida capillaris. Rare.
Syntherisma malacophylla. Rare.
Syntherisma cuyabensis. Rare.
Axonopus capillaris. Frequent.
Axonopus compressus. Common.
Axonopus stragulus. Frequent.
Paspalum multicaule. Common.
Paspalum pumilum. Frequent.
Paspalum pulchellum. Infrequent.
Paspalum decumbens. Frequent.
Paspalum nutans. Frequent.
Paspalum coryphaeum. Infrequent.
Panicum molle. Rare.
Panicum trichoides. Frequent.
Panicum millegrana. Rare.
Panicum stenodes. Infrequent.
Panicum rudgei. Frequent.
Cenchrus dactylolepis. Infrequent.
Raddia nana. Rare.
Raddia malmeana. Rare.
Andropogon virgatus. Infrequent.
Tripsacum latifolium. Rare.

In the upland savannas which form the grazing areas, such as those of the Rupununi District, the species are about the same as those of the Venezuela savannas. Some of the species extend into the dry savannas of Panama and Central America or even to Mexico. The following may be called savanna grasses:

Triodia flaccida. Rare.
Leptochloa domingensis. Rare.
Chloris polydactyla. Rare.
Leptocoryphium lanatum. Common.
Axonopus aureus. Infrequent.
Axonopus scoparius. Rare.
Paspalum carinatum. Rare.
Paspalum serpentinum. Rare.
Paspalum abrahami. Frequent.

Panicum olyroides. Rare.
Ichnanthus ichnodes. Rare.
Lasiacis procerrima. Rare.
Chaetochloa tenax. Infrequent.
Pennisetum setosum. Infrequent.
Arundinella hispida. Frequent.
Andropogon leucostachyus. Frequent.
Andropogon selloanus. Frequent.
Cymbopogon bracteatus. Common.
Heteropogon contortus. Common.
Trachypogon plumosus. Common.
Elyonurus adustus. Common.

Most of the remaining species might be called forest grasses. They grow at the edge of the forest or in somewhat open woods where light penetrates. The following are forest grasses:

Guadua angustifolia. A bamboo; infrequent.
Guadua glomerata. A bamboo; infrequent.
Orthoclada laxa. Infrequent.
Pariana radiciflora. Rare.
Pariana zingiberina. Rare.
Pharus latifolia. Rare.
Pseudechinolaena polystachya. Rare.
Panicum stoloniferum. Infrequent.
Panicum magnum. Infrequent.
Ichnanthus panicoides. On the floor of the virgin forest. Infrequent.
Ichnanthus riedelii. Infrequent.
Ichnanthus axillaris. Common.
Ichnanthus pallens. Common.
Lasiacis ligulata. Frequent in the Northwest District.
Lasiacis sorghoidea. Rare.
Oplismenus hirtellus. Infrequent.
Olyra surinamensis. Frequent.
Olyra micrantha. Infrequent.
Olyra cordifolia. Rare.
Olyra caudata. Rare.
Olyra latifolia. Infrequent.

A few species are, so far as our specimens show, confined in British Guiana to the vicinity of Mount Roraima. These are:

Arundinaria deflexa.
Chusquea linearis.
Cortaderia roraimensis.
Paspalum pectinatum.
Panicum chnoodes.
Panicum eligulatum.

Three species (*Paspalum orbiculatum potaroense*, *Panicum asperifolium*, *P. pilcomayense*) can not be assigned definitely to any of the series mentioned, because of insufficient data.

Only two grasses are cultivated for forage, Guinea grass and Pará grass. Guinea grass (*Panicum maximum*) is commonly cultivated in the drier regions of the tropics, but appears to be rare in British Guiana, probably because it is not so well adapted to the wet soil of the coastal belt as is Pará grass. Pará grass (*Panicum barbinode*) is also commonly cultivated throughout the tropics at low elevations in moist soil, and is the chief forage grass of British Guiana.

The open grassland in the vicinity of the coast consists chiefly of three species: Bahama grass (*Capriola dactylon*, called Bermuda grass in the United States); carpet grass (*Axonopus compressus*); and sourgrass (*Paspalum conjugatum*). This mixture is cut and fed green to donkeys and other animals. The Bahama grass prefers drier land than the other two and is a frequent constituent of lawns. Sourgrass is usually considered an unsatisfactory forage grass, as it is not very palatable, but being mixed with the others must be gathered along with it. The wild grazing grasses of the upland savannas have been referred to in a preceding paragraph.

A few grasses are cultivated for ornament. Several species of bamboos, the reed (*Arundo donax*), pampas-grass (*Cortaderia argentea*), and, probably more commonly than the others, tiger grass, are used in parks and lawns. Tiger grass (*Thysanolaena acarifera* (Trin.) Arn. & Nees; *T. agrostis* Nees) is a robust perennial 2 to 3 meters tall, with broad flat blades, and large panicles of very small spikelets. It grows in large dark green clumps. Khuskhus or vetiver (*Anatherum zizanioides*) is grown as a hedge plant. The aromatic roots are used for screens and mats, giving off a pleasant odor when wet. Jobs-tears (*Coix lacryma-jobi*) is cultivated for the hard oval involucral bracts which are used for beads.

The drawings illustrating the new species were made by Mary Wright Gill, in each case from the type specimen. The figures are at half natural size.

Two early works contain descriptions of the grasses of British Guiana. The identity of the species is given below.

Rudge, Plantarum Guianae Rariorum Icones et Descriptiones, 1805.

Cenchrus marginalis Rudge=*Echinolaena inflexa* (Poir.) Chase.
Paspalum gracile Rudge=*P. repens* Bergius.
Panicum amplexicaule Rudge=*Hymenachne amplexicaule* (Rudge) Nees.
Panicum commelinaefolium Rudge=*Panicum nervosum* Lam.
Panicum scoparium Rudge=*P. rudgei* Roem. & Schult.
Aristida elegans Rudge=*A. capillacea* Lam.

Meyer, Primitiae Florae Essequeboensis, 1818.
Eriochloa kunthii Meyer=*E. punctata* (L.) Desv.
Paspalum conjugatum Willd. [Bergius].
Paspalum platycaule [Poir.]=*Axonopus compressus* (Swartz) Beauv.
Paspalum virgatum Flügge [L.].
Panicum myurum Lam.=*Hymenachne amplexicaulis* (Rudge) Nees.
Panicum fluitans Willd.=*P. geminatum* Forsk.
Panicum velutinum Meyer=*Oplismenus hirtellus* (L.) Beauv.
Panicum crusgalli Willd.=*Echinochloa crusgalli crus-pavonis* (H. B. K.) Hitchc.
Panicum horizontale (Willd.) Meyer=*Syntherisma digitata* (Swartz) Hitchc.
Panicum lineare Willd.=*Syntherisma chinensis* (Nees) Hitchc.
Panicum frondescens Meyer.
Panicum pilisparsum Meyer=*P. pilosum* Swartz.
Panicum tenuiculme Meyer=*P. laxum* Swartz.
Panicum isocalycium Meyer=*Homolepis isocalycia* (Meyer) Chase.
Panicum insulare Meyer=*Valota insularis* (L.) Chase.
Panicum glutinosum Lam.=*Lasiacis ligulata* Hitchc. & Chase.
Panicum altissimum Meyer=*P. megiston* Schult.
Cenchrus echinatus Vahl. [L.].
Saccharum officinarum Willd. [L.].
Saccharum caudatum Meyer=*Imperata contracta* (H. B. K.) Hitchc.
Andropogon bicornis Willd. [L.].
Leptostachys virgata Meyer=*Leptochloa virgata* (L.) Beauv.
Eleusine indica Michx. [(L.) Gaertn.].
Poa ciliaris Willd. [L.]=*Eragrostis ciliaris* (L.) Link.

Schomburgk[6] gives a list of species without descriptions. The identity of the species can be determined only by consulting the collections at the British Museum.

DESCRIPTIVE LIST, WITH KEYS.

KEY TO THE TRIBES.[7]

Series 1. POATAE.

Spikelets 1 to many-flowered, the reduced florets, if any, above the perfect florets (1 or 2 sterile lemmas below in Bamboseae); articulation usually above the glumes.

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[6] Versuch einer Fauna und Flora von Britisch-Guiana. 1848.

[7] The sequence of genera is that of The Genera of Grasses of the United States, by A. S. Hitchcock (U. S. Dept. Agr. Bull. **772.** 1920).

Plants woody, arborescent or clambering; spikelets 1 to many-flowered, 1 to several sterile lemmas below the perfect ones_____1. **BAMBOSEAE.**
Plants herbaceous (somewhat woody in *Arundo*).
Spikelets articulate below the glumes, 1-flowered, either much compressed, or, if not, then unisexual, never in dense spikes; glumes often reduced, sometimes wanting.
Spikelets perfect_____6. **ORYZEAE.**
Spikelets unisexual; plants monoecious_____7. **ZIZANIEAE.**
Spikelets articulate above the glumes (except in *Spartina* and *Orthoclada*).
Spikelets sessile on a continuous rachis, forming spikes (short-pedicellate in *Leptochloa*).
Spikelets on opposite sides of the rachis; spike terminal, single.
3. HORDEAE.
Spikelets on one side of the rachis; spikes usually more than 1, digitate or racemose_____4. **CHLORIDEAE.**
Spikelets pedicellate in open or contracted panicles.
Spikelets 1-flowered; leaf blades never broad and net-veined.
5. AGROSTIDEAE.
Spikelets 2 to many-flowered (often reduced to 1 floret and a prolonged rachilla joint in *Orthoclada*, this with net-veined blades).
2. FESTUCEAE.

Series 2. PANICATAE.

Spikelets with 1 perfect terminal floret (disregarding the few monoecious genera and the staminate and neuter spikelets) and a sterile or staminate floret below, usually represented by a sterile lemma only, one glume sometimes, rarely both glumes, wanting; articulation below the spikelets, either in the pedicel, in the rachis, or at the base of a cluster of spikelets, the spikelets falling entire, either singly, in groups, or together with joints of the rachis; spikelets, or at least the fruits, more or less dorsally compressed.

Glumes indurate; fertile lemma and palea hyaline or membranaceous, the sterile lemma like the fertile one in texture.
Inflorescence not monoecious, the fertile spikelets perfect, each usually paired with a sterile spikelet_____10. **ANDROPOGONEAE.**
Inflorescence monoecious, the pistillate spikelets below, the staminate above on the same rachis_____11. **TRIPSACEAE.**
Glumes membranaceous; fertile lemma and palea indurate or at least as firm as the glumes; sterile lemma like the glumes in texture.
Fertile lemma and palea scarcely firmer than the glumes__8. **MELINIDEAE.**
Fertile lemma and palea indurate or subindurate, usually much firmer than the glumes_____9. **PANICEAE.**

KEY TO THE GENERA.

1. BAMBOSEAE.

Stamens 6; spikelets several-flowered_____3. **Guadua.**
Stamens 3.
Spikelets few to several-flowered_____1. **Arundinaria.**
Spikelets 1-flowered_____2. **Chusquea.**

2. FESTUCEAE.

Spikelets not long-hairy.
Blades broad, elliptic; spikelets falling entire; lemmas finely several-nerved.
5. Orthoclada.

Blades linear; glumes persistent; lemmas 3-nerved.
Nerves of lemma glabrous----4. Eragrostis.
Nerves of lemma pubescent----9. Triodia.
Spikelets (at least the pistillate) with copious long silky hairs on the lemmas or the rachilla.
Spikelets perfect; lemmas hairy; rachilla glabrous----6. Arundo.
Spikelets unisexual; pistillate spikelets hairy, the staminate glabrous or hairy. Plants dioecious.
Culm very tall, short-jointed, the sheaths conspicuously imbricate (the blades commonly fallen from the lower sheaths); staminate spikelets glabrous, the panicle very different in appearance from that of the pistillate spikelets----7. Gynerium.
Culm with long joints, the sheaths not closely imbricate, the plants densely leafy at the base; staminate spikelets hairy, the panicle resembling that of the pistillate spikelets----8. Cortaderia.

3. HORDEAE.

A single genus, of doubtful affinity, in British Guiana----10. Pariana.

4. CHLORIDEAE.

Spikes racemosely arranged.
Spikes appressed. A maritime grass with stout rhizomes----15. Spartina.
Spikes spreading.
Spikes short and numerous----18. Bouteloua.
Spikes long and slender----11. Leptochloa.
Spikes digitate or approximate.
Spikelets with 2 or more perfect florets.
Rachis extending beyond the spikelets----13. Dactyloctenium.
Rachis not extending beyond the spikelets----12. Eleusine.
Spikelets with 1 perfect floret only.
Sterile floret wanting; lemma obtuse----14. Capriola.
Sterile floret present; lemma awned or mucronate.
Leaves scattered along the culm, short; spikes approximate but not digitate----16. Gymnopogon.
Leaves mostly basal; spikes digitate----17. Chloris.

5. AGROSTIDEAE.

Spikelets awnless----19. Sporobolus.
Spikelets awned----20. Aristida.

6. ORYZEAE.

Glumes present, small; lemmas awned----21. Oryza.
Glumes wanting; lemmas awnless----22. Homalocenchrus.

7. ZIZANIEAE.

Blades narrowly linear----23. Luziola.
Blades broad, oblanceolate-oblong----24. Pharus.

8. MELINIDEAE.

A single genus in British Guiana----25. Arundinella.

9. PANICEAE.

Spikelets unisexual. Plants monoecious.
Plants tall; blades mostly more than 2 cm. wide—47. Olyra.
Plants low; blades less than 1 cm. wide—48. Raddia.
Spikelets perfect.
Axis thickened and corky, the spikelets sunken in cavities in its joints, these disarticulating at maturity—29. Stenotaphrum.
Axis not thickened, the spikelets not sunken in it.
Spikelets subtended or surrounded by 1 to many bristles or spines (sterile branchlets), these distinct or more or less connate at base, forming a false involucre.
Bristles persistent; spikelets deciduous—44. Chaetochloa.
Bristles falling with the spikelets at maturity.
Bristles not united at base, usually slender, often plumose.
45. Pennisetum.
Bristles more or less united at the base, forming a bur—46. Cenchrus.
Spikelets not subtended or surrounded by bristles.
Spikelets awned, in 1-sided simple or somewhat compound racemes (pointed only in *Echinochloa colonum*).
Blades lanceolate, broad and thin; longest awn on the first glume.
42. Oplismenus.
Blades long and narrow; longest awn on the sterile lemma.
43. Echinochloa.
Spikelets awnless.
Spikelets in open panicles.
Spikelets globose, oblique on the pedicels. Culms usually woody.
37. Lasiacis.
Spikelets not globose and obliquely set on the pedicels.
Spikelets with 2 perfect florets—41. Isachne.
Spikelets with 1 perfect floret.
Fertile lemma with wings or broad scars at base.
36. Ichnanthus.
Fertile lemma not winged nor broadly scarred at base.
First glume wanting. Spikelets silky-hairy.
26. Leptocoryphium.
First glume present.
Fruit indurate, its margin inrolled; first glume usually shorter than the spikelet—35. Panicum.
Fruit cartilaginous, the margin not inrolled; first glume as long as the spikelet—40. Homolepis.
Spikelets in spikelike panicles or in 1-sided racemes, the racemes digitate or racemose.
Rachilla joint and adnate first glume forming a swollen ringlike callus at the base of the spikelet—32. Eriochloa.
Rachilla joint not forming a ringlike callus.
Inflorescence a long narrow panicle, spikelike or with numerous appressed racemes of pointed spikelets.
Second glume inflated-saccate; blades linear—38. Sacciolepis.
Second glume not saccate; blades cordate at base.
39. Hymenachne.
Inflorescence not long and narrow. (Racemes distant and appressed in *Panicum geminatum*.)

Fruit cartilaginous, not rigid, the margins of the lemma flat, not inrolled. Inflorescence of digitate or flabellately panicled, slender racemes.
Spikelets conspicuously long-silky—27. Valota.
Spikelets glabrous or with short pubescence—28. Syntherisma.
Fruit indurate, rigid (subindurate in some species of *Paspalum*).
Spikelets solitary, subsessile, placed with the back of the fruit turned away from the rachis.
First glume wanting—33. Axonopus.
First glume as long as the spikelet.
Racemes single, dense—30. Echinolaena.
Racemes several, loose—31. Pseudechinolaena.
Spikelets in 2's or 3's or solitary, placed with the back of the fruit turned toward the rachis.
First glume wanting (rarely present in a part of the spikelets, commonly present in *P. decumbens*); spikelets plano-convex, in dense 1-sided spikelike racemes. 34. Paspalum.
First glume present; spikelets biconvex—35. Panicum.

10. ANDROPOGONEAE.

Spikelets all perfect.
Inflorescence of 2 to several racemes—59. Ischaemum.
Inflorescence a densely-flowered hairy panicle—49. Imperata.
Spikelets not all perfect, the sessile usually perfect, the pedicellate usually staminate or rudimentary (pistillate in *Eriochrysis*).
Pedicels thickened, appressed to the thickened rachis joint (at least parallel to it) or adnate to it; spikelets awnless, appressed to the joint.
Racemes subcylindric; rachis joints and pedicels glabrous, much thicker at the summit, the spikelets sunken in the hollow below; sterile spikelet rudimentary—58. Manisuris.
Racemes flat; rachis joints and pedicels woolly, not much thicker at the summit; sterile spikelet staminate or neuter—57. Elyonurus.
Pedicels not thickened (if slightly so the spikelets awned), neither appressed nor adnate to the rachis joint, this usually slender; spikelets usually awned.
Fertile spikelet with a hairy-pointed callus, formed of the attached supporting rachis joint or pedicel. Awns strong.
Primary spikelet subsessile, sterile, persistent on the continuous axis after the fall of the fertile pedicellate spikelet, the pedicel forming the callus—56. Trachypogon.
Primary spikelet sessile, fertile; pedicellate spikelet sterile; lower few to several pairs of spikelets all staminate or neuter. 55. Heteropogon.
Fertile spikelet without a callus, the rachis disarticulating immediately below the spikelet.
Inflorescence a dense golden-brown silky panicle; spikelets awnless, the pedicellate one pistillate—54. Eriochrysis.
Inflorescence not a dense golden-brown silky panicle; pedicellate spikelet staminate or rudimentary.
Spikelets in reduced racemes of 1 to 5 (rarely 7) joints, these peduncled in open panicles. Awns, if present, commonly deciduous. 53. Holcus.

Spikelets in evident racemes of several to many joints.
Inflorescence an elongate panicle of whorled long-peduncled slender glabrous racemes; spikelets muricate, awnless__52. **Anatherum.**
Inflorescence not a panicle of long-peduncled racemes; spikelets not muricate. Racemes often conspicuously woolly.
Racemes 2, forking from the summit of the slender peduncle, a staminate awnless spikelet borne in the fork.
51. **Cymbopogon.**
Racemes 1 to many, not forking with a spikelet borne in the fork.
50. **Andropogon.**

11. TRIPSACEAE.

Pistillate spikelets sunken in recesses in the thickened joints of the rachis.
Inflorescence of solitary or digitate spikes_____60. **Tripsacum.**
Pistillate spikelets inclosed in a bony bead-like involucre_____61. **Coix.**

1. ARUNDINARIA Michx.

Spikelets few to many-flowered; stamens 3.

1. **Arundinaria deflexa** N. E. Brown, Trans. Linn. Soc. II. Bot. 6[1]: 75. 1901.

Blades ovate-lanceolate, deflexed, 10 to 15 cm. long, 2 to 2.5 cm. wide, the summit of the sheath long-fimbriate.

McConnell & Quelch 678, summit of Mt. Roraima, the type collection and the only one known.

2. CHUSQUEA Kunth.

Spikelets small, with 1 perfect floret and 2 empty lemmas below it; stamens 3; blades disarticulating from the persistent sheaths.

1. **Chusquea linearis** N. E. Brown, Trans. Linn. Soc. II. Bot. 6[1]: 76. 1901.

A climbing bamboo with short leafy branches in clusters on the main stem, the blades 10 to 15 mm. long and 2 to 3 mm. wide; inflorescence narrow, few-flowered, terminating the short branches.

McConnell & Quelch 677, summit of Mt. Roraima, the type collection and the only one known.

3. GUADUA Kunth.

Spikelets several-flowered, subterete, elongate; stamens 6; palea winged. Our species spiny.

Blades less than 2 cm. wide_____1. **G. angustifolia.**
Blades more than 2 cm. wide_____2. **G. glomerata.**

1. **Guadua angustifolia** Kunth, Syn. Pl. Aequin. 1: 253. 1822.

Bambusa guadua Humb. & Bonpl. Pl. Aequin. 168. *pl. 20.* 1808.

Nastus guadua Spreng. Syst. Veg. 2: 113. 1825.

A tall bamboo, as much as 10 meters tall and 15 cm. in diameter; blades about 15 cm. long and 12 to 18 mm. wide; spikelets often curved, at maturity 3.5 to nearly 7 cm. long.

RANGE: Colombia to Peru and Guiana. Originally described from Colombia.

SPECIMENS FROM BRITISH GUIANA: Demerara River, *Jenman* 605. Aruka River, *Jenman* 7274. Without locality, *Jenman* 6249, 6370.

2. **Guadua glomerata** Munro, Trans. Linn. Soc. 26: 79. 1868.

A climbing or clambering bamboo; blades 10 to 15 cm. long, 2 to 3 cm. wide; spikelets few in a cluster at the ends of the foliage branchlets, as much as 6 cm. long, the lower deflexed, stouter than those of *G. angustifolia.*

RANGE: River banks, Guiana to Brazil. Originally described from the Río Negro.

SPECIMENS FROM BRITISH GUIANA: Rockstone, climbing high, wet forest, *Hitchcock* 17331. Bartica, *Jenman* 2445. Essequibo and Demerara rivers, *Jenman* 6352.

Bambos vulgaris Schrad., the common bamboo, is frequently cultivated and may be spontaneous.

4. ERAGROSTIS Host.

Spikelets few to many-flowered, compressed; glumes and lemmas keeled, the lemmas 3-nerved; rachilla often continuous, the paleas usually persistent after the fall of the fruit. Our species are all annuals.

Palea ciliate on the keels, the cilia usually as long as the width of the lemmas.
  Spikelets about 2 mm. long, pediceled; panicle open_____1. E. amabilis.
  Spikelets usually 3 to 4 mm. long, sometimes many-flowered, mostly subsessile; panicle close and spikelike, usually interrupted____2. E. ciliaris.

Palea not long-ciliate on the keels.
  Spikelets nearly sessile, linear, many-flowered, the pedicels villous.
    3. E. maypurensis.
  Spikelets pediceled, the pedicels glabrous or scabrous only, as long as the spikelets or longer.
    Spikelets linear, many-flowered, on stiff straight spreading pedicels.
      4. E. guianensis.
    Spikelets mostly less than 8-flowered, ovate or ovate-oblong.
      Spikelets 2 mm. wide, mostly 6 to 8-flowered_____5. E. tephrosanthos.
      Spikelets 1.5 mm. wide, mostly 3 to 5-flowered_____6. E. pilosa.

1. **Eragrostis amabilis** (L.) Wight & Arn.; Hook. & Arn. Bot. Beechey Voy. 251. 1841.

Poa amabilis L. Sp. Pl. 68. 1753.

Poa plumosa Retz. Obs. Bot. 4: 20. 1786.

Eragrostis plumosa Link, Hort. Berol. 1: 193. 1827.

A low tufted branching annual, with slender ascending or spreading culms, linear blades, and handsome oblong panicles, the spikelets mostly borne along the lower side of the ascending branches.

RANGE: Open ground and waste places, warmer regions of both hemispheres. A native of the Old World. Originally described from India.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Promenade Gardens, a weed in flower beds, *Hitchcock* 16580. Rockstone, *Gleason* 698.

2. **Eragrostis ciliaris** (L.) Link, Hort. Berol. 1: 192. 1827.

Poa ciliaris L. Syst. Nat. ed. 10. 2: 875. 1759.

Plants spreading at base, the slender culms erect, mostly 10 to 30 cm. tall, with dense spikelike panicles, interrupted at base.

RANGE: Open ground and waste places, warmer regions of both hemispheres. Apparently introduced in America; originally described from Jamaica. Common in the West Indies but rare in British Guiana.

SPECIMENS FROM BRITISH GUIANA: Litchfield, along railway track, *Hitchcock* 16826. Tumatumari, open sandy-clay loam along road, *Hitchcock* 17333. Also Meyer, a fragment from a specimen in the Trinius Herbarium labeled "Fl. Esseq."

3. Eragrostis maypurensis (H. B. K.) Steud. Syn. Pl. Glum. **1**: 276. 1854.
Poa maypurensis H. B. K. Nov. Gen. & Sp. **1**: 161. 1816.
Poa vahlii Roem. & Schult. Syst. Veg. **2**: 563. 1817.
Eragrostis vahlii Nees, Agrost. Bras. 499. 1829.
Eragrostis amoena Presl, Rel. Haenk. **1**: 275. 1830.
Eragrostis panamensis Presl, Rel. Haenk. **1**: 277. 1830.
Megastachya amoena Fourn. Mex. Pl. **2**: 118. 1886.
Megastachya panamensis Fourn. Mex. Pl. **2**: 118. 1886.

Culms erect from a spreading base, 10 to 30 cm. tall, the narrow blades mostly near the base; panicles brownish or yellowish, narrow, the short branches somewhat distant, stiffly ascending, spikelet-bearing from the base; spikelets linear, as much as 15 mm. long.

RANGE: Open ground, especially in sandy soil, western Mexico to Brazil. Originally described from Venezuela.

SPECIMENS FROM BRITISH GUIANA: Tumatumari, open ground, sandy clay loam, along road, *Hitchcock* 17334; *Gleason* 39. Orealla, Courantyne River, *Jenman* 274*.[8] Inturibisci Lake, *Jenman* 2248. Kwaimatta, *Jenman* 6196, 6774*. Without locality, *Schomburgk* 1004.

4. Eragrostis guianensis Hitchc., sp. nov. Fig. 78.

Plants annual; culms cespitose, slender and wiry, about 20 cm. tall; sheaths glabrous or sparsely papillose-pilose, pilose at the throat; blades short and narrow, involute, filiform, 1 to 3 cm. long, sometimes sparsely pilose; panicle open, about 10 cm. long, the axis smooth, the capillary branches stiffly ascending-spreading, single, rather distant, naked in the axils, smooth or the ultimate pedicels scaberulous, the spikelets mostly borne on the secondary branches, each main branch bearing 1 to 4 spikelets, the shorter pedicels being about 5 mm. long; spikelets linear, mostly 1.5 to 2 cm. long, scarcely 2 mm. wide; yellowish or brownish, as many as 50-flowered; glumes acute, narrow, 1-nerved, a little unequal, the first 1 mm. long, smooth on the keel; lemmas closely imbricate, ovate-lanceolate, about 1.5 mm. long, obtusish, strongly 3-nerved, smooth; palea persistent, minutely scaberulous or ciliolate on the keels.

Type in the U. S. National Herbarium, no. 1,039,337, collected at Kwaimatta, Rupununi River, southern British Guiana, October, 1888, by G. S. Jenman (no. 5970).

The only other specimens seen is from Mt. Roraima (*Loyed* 13*).

5. Eragrostis tephrosanthos Schult. Mant. **2**: 316. 1824.
Eragrostis delicatula Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. **2**[1]: 73. 1836.

A delicate spreading grass, the culms 10 to 20 cm. long, with oblong or ovoid panicles; spikelets mostly 3 to 5 mm. long, green or olive.

RANGE: Open ground, fields, and waste places, West Indies to Brazil. Originally described from Martinique.

SPECIMENS FROM BRITISH GUIANA: Georgetown, along walks in the Promenade Gardens, *Hitchcock* 16599. Morawhanna, a weed in the grounds of Commissioner King, *Hitchcock* 17471. Lamaha, *Jenman* 3885. Coast lands, *Jenman* 4375, 5999.

6. Eragrostis pilosa (L.) Beauv. Ess. Agrost. 162. 1812.
Poa pilosa L. Sp. Pl. 68. 1753.

Similar in habit to the preceding, the panicle more delicate, the spikelets narrower.

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[8] The numbers marked with an asterisk are in the Jenman Herbarium at Georgetown but are not in the U. S. National Herbarium.

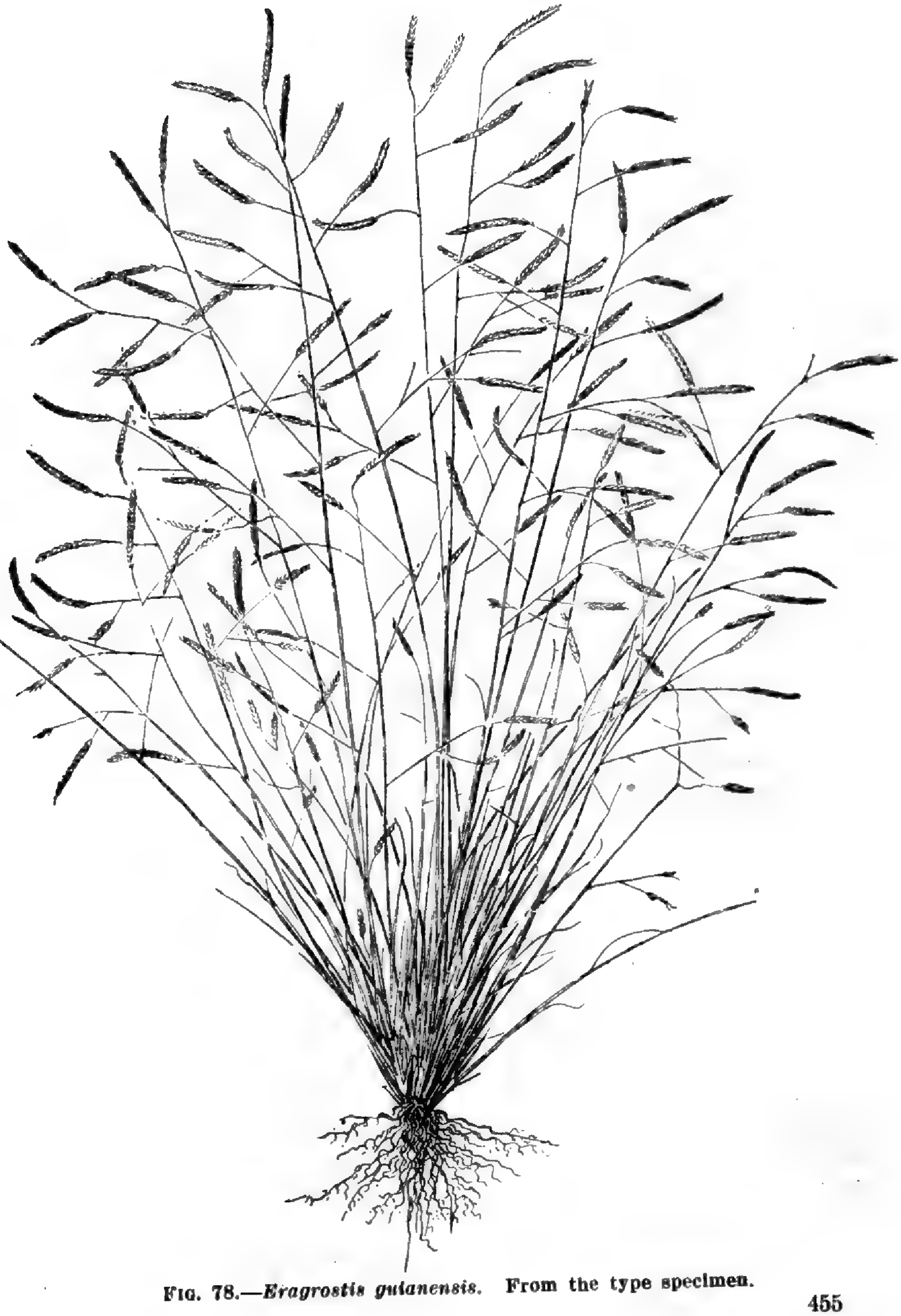

Fig. 78.—*Eragrostis guianensis.* From the type specimen.

RANGE: Open ground and waste places in warm and temperate regions of both hemispheres. Originally described from Italy. Common in the West Indies but rare in British Guiana.

SPECIMEN FROM BRITISH GUIANA: Bartica, a weed around the house at Agatasch Estate, *Hitchcock* 17188.

5. ORTHOCLADA Beauv.

Spikelets articulate below the glumes, 1-flowered with a prolongation of the rachilla or 2-flowered, the florets distant; glumes and lemmas acuminate.

1. **Orthoclada laxa** (L. Rich.) Beauv.; Nees, Agrost. Bras. 522. 1829.

Aira laxa L. Rich. Act. Soc. Hist. Paris 1: 106. 1792.

Panicum rariflorum Lam. Encycl. 4: 746. 1798.

Orthoclada rariflora Beauv. Ess. Agrost. 70. *pl. 14. f. 9.* 1812.

A stoloniferous perennial; flowering culms ascending, leafy, simple, commonly 0.5 to 1 meter long; blades slender-petioled, lanceolate, mostly 12 to 15 cm. long, about 2.5 cm. wide; panicle large, as broad as long, the long, slender, naked branches and capillary branchlets at first erect, finally stiffly divergent, bearing 1 to few spikelets at the extremities.

RANGE: Rich woods, southern Mexico to Brazil. Originally described from Cayenne.

SPECIMENS FROM BRITISH GUIANA: Akyma, floor of forest, *Hitchcock* 17451. Issorora, forest, *Hitchcock*, 17555. Orealla, Courantyne River, *Jenman* 258*. Upper Demerara River, *Jenman* 4092*. Lama, *Jenman* 5979. Berbice, *Jenman* 6814. Barima River, *Jenman* 7075*. Pomeroon River, *Bartlett* in 1904, *Stockdale* in 1909.

6. ARUNDO L.

Spikelets perfect, 2 to several-flowered; glumes about equaling the spikelet; lemmas bidentate, cuspidate between the teeth and with long, silky hairs on the back; rachilla naked.

1. **Arundo donax** L. Sp. Pl. 81. 1753. GIANT REED.

Tall reeds with strong, sparingly branching culms, elongate, scabrous-margined flat blades and densely flowered, slightly drooping panicles, 30 to 60 cm. long, the spikelets about 1 cm. long.

RANGE: River banks and moist ground, warmer parts of the Old World. Cultivated in the American tropics and established in many places.

SPECIMEN FROM BRITISH GUIANA: Litchfield, moist ground, *Hitchcock* 16827.

7. GYNERIUM Humb. & Bonpl.

Plants dioecious; spikelets 2-flowered; pistillate spikelets with long-attenuate second glumes much exceeding the small attenuate long-silky lemmas; staminate spikelets with shorter glumes and glabrous lemmas.

1. **Gynerium sagittatum** (Aubl.) Beauv. Ess. Agrost. 138. *pl. 24. f. 6.* 1812. UVA GRASS.

Saccharum sagittatum Aubl. Pl. Guian. 1: 50. 1775.

Gynerium saccharoides Humb. & Bonpl. Pl. Aequin. 2: 105. *pl. 115.* 1809.

Arundo saccharoides Poir. in Lam. Encycl. Suppl. 4: 703. 1816.

Stout reeds often 10 meters tall, with culms clothed below with old sheaths, the blades having fallen, sharply serrulate blades, commonly 2 meters long and 4 to 6 cm. wide (forming a great fan-shaped summit to the sterile culms), and pale, plumy, densely flowered panicles 1 meter or more long, the main axis erect, the branches drooping.

RANGE: River banks and moist ground, forming dense colonies, West Indies and southern Mexico to Brazil. Originally described from French Guiana.

SPECIMENS FROM BRITISH GUIANA: Parika, low ground near sea; plants as much as 8 meters tall, *Hitchcock* 16759. Morawhanna, swamp back of mangroves, *Hitchcok* 17518. Upper Demerara River, *Jenman* 4030. Demerara River, *Jenman* 4397*.

Beauvois's figure cited above (*pl. 24. f. 6*) is referred to in the description of plates as *Gynerium procerum*.

8. CORTADERIA Stapf.

Plants dioecious, the staminate and pistillate panicles alike in appearance; spikelets loosely 3 to 7-flowered, the glumes equal, exceeded by the delicate awn tips of the lemmas. Leaves narrow, mostly in a basal cluster.

1. **Cortaderia roraimensis** (N. E. Brown) Pilger, Notizbl. Bot. Gart. Berlin 6: 112. 1914.

Arundo roraimensis N. E. Brown, Trans. Linn. Soc. II. Bot. 6[1]: 74. 1901.

Plant as much as 1 meter tall, the lower blades as much as 50 cm. long, the upper short and narrow; panicle 10 to 15 cm. long, about 5 cm. wide; spikelets 15 to 18 mm. long; glumes 7 to 9 mm. long; lemmas 6 mm. long with an awn about 8 mm. long, the hairs about 4 mm. long; palea 5 mm. long, oblong-linear, bifid at apex.

This species is known only from the type collection, *McConnell & Quelch* 673, summit of Mt. Roraima. It resembles *Cortaderia nitida* (H. B. K.) Pilger (*Arundo nitida* H. B. K.), from which it differs in having unisexual spikelets and shorter and fewer hairs on the lemma and rachilla joints.

9. TRIODIA R. Br.

Spikelets several-flowered; lemmas broad, rounded on the back, 2-lobed at apex, 3-nerved, the nerves pubescent below, produced as teeth at the summit.

1. **Triodia flaccida** (Doell) Hitchc.

Uralepis flaccida Doell in Mart. Fl. Bras. 2[3]: 95. 1878.

Culms slender, as much as 1 meter tall; panicle open; spikelets 3 to 5-flowered, reddish; lemma mucronate between two short rounded lobes.

RANGE: Western Brazil and Guiana. Originally described from Brazil.

SPECIMEN FROM BRITISH GUIANA: Rupununi Savanna, *Melville*.

10. PARIANA Aubl.[a]

Spikelets in opposite clusters of 3 at each joint of a readily disarticulating rachis forming a spike, the center flower of the cluster pistillate, the other 2 staminate; stamens numerous.

The relationships of this genus are doubtful. Following Hackel, it is tentatively placed here as a representative of the Hordeae.

Sheaths long-fimbriate at the summit ..... 1. P. radiciflora.
Sheaths naked, or nearly so, at the summit ..... 2. P. zingiberina.

1. **Pariana radiciflora** Sagot; Doell in Mart. Fl. Bras. 2[3]: 336. 1877.

Plants 30 to 50 cm. tall, the inflorescence on distinct shoots; sterile shoots leafy, the sheaths roughish toward the summit, the blades broad and flat, short-petioled, smooth, 10 to 15 cm. long 4 to 5 cm. wide, acuminate; fertile shoot with somewhat inflated sheaths, the blade reduced to a point or wanting; spike 5 to 7 cm. long, erect, awnless.

RANGE: Rich forests, Guiana to Brazil.

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[a] See page 513.

SPECIMENS FROM BRITISH GUIANA: Kartabo, near cassava patch in edge of clearing, *Hitchcock* 17211. Rockstone, *Bartlett* 8573*. Essequibo River, *Jenman* 1311*. Mazaruni River, *Jenman* 5798*.

2. Pariana zingiberina Doell in Mart. Fl. Bras. 2^2: 337. 1877.

Differs from the preceding chiefly in the absence of the fimbriae at the summit of the sheaths. The blades are narrower, up to 3.5 cm. in our specimen.

RANGE: Rich forest, Guiana to Brazil.

SPECIMEN FROM BRITISH GUIANA: Bartica, *Jenman* 6026. Rockstone, *Gleason* 860.

11. LEPTOCHLOA Beauv.

Spikelets few to many-flowered, short-pedicellate, appressed, loosely imbricate along a narrow rachis, forming slender racemes, these numerous in an elongate panicle; glumes and lemmas keeled, the lemmas 3-nerved.

Plants annual.

Sheaths papillose-hispid ..... 1. L. filiformis.
Sheaths minutely scabrous but not hispid ..... 2. L. scabra.

Plants perennial.

Sheaths and blades glabrous, usually somewhat glaucous; florets awnless or the awn shorter than the body of the lemma ..... 3. L. virgata.
Sheaths sparsely papillose-hispid; awns, or some of them, about as long as their lemmas ..... 4. L. domingensis.

1. Leptochloa filiformis (Lam.) Beauv. Ess. Agrost. 71, 166. 1812.

Festuca filiformis Lam. Tabl. Encycl. 1: 191. 1791.
Eleusine mucronata Michx. Fl. Bor. Amer. 1: 65. 1803.
Eleusine filiformis Pers. Syn. Pl. 1 : 87. 1805.
Leptostachys filiformis Meyer, Prim. Fl. Esseq. 74. 1818.
Leptochloa mucronata Kunth, Rév. Gram. 1: 91. 1829.

Culms ascending or erect, geniculate below, branching at the base, commonly 40 to 70 cm. tall (dwarf specimens 10 to 20 cm. tall); blades thin, flat; racemes very slender, spreading.

RANGE: Fields and open ground, southern United States to Argentina. Originally described from tropical America.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Promenade Gardens, a weed in flower beds, *Hitchcock* 16579. Coast lands, *Jenman* 6035, 6037.

2. Leptochloa scabra Nees, Agrost. Bras. 435. 1829.

Resembling the preceding, but commonly taller and more robust, the inflorescence narrower, the spikes less slender, ascending, flexuous, the spikelets larger.

RANGE: Ditches and wet places, West Indies to Brazil, whence originally described.

SPECIMENS FROM BRITISH GUIANA: Georgetown, near Peters Hall, a weed along canal, *Hitchcock* 16686. New Amsterdam, along ditch, *Hitchcock* 16832. Morawhanna, a weed in the grounds of Commissioner King, *Hitchcock* 17479. Lamaha, *Jenman* 3730. Coast regions, *Jenman* 2163*, 4441.

3. Leptochloa virgata (L.) Beauv. Ess. Agrost. 71, 161, 166. *pl. 15. f. 1.* 1812.

Cynosurus virgatus L. Syst. Nat. ed. 10, 2 : 876. 1759.
Leptostachys virgata Meyer, Prim. Fl. Esseq. 74. 1818.
Leptochloa perennis Hack. Inf. Est. Centr. Agron. Cuba 1: 411. 1906.

Culms in small tufts, tall, slender, strong and wiry, sparingly branching; blades flat; racemes commonly about 10 cm. long, lax, ascending, aggregate toward the summit of the culm.

RANGE: Open ground and brush land, Mexico and the West Indies to Brazil. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Peters Hall, low ground in field back of the sea, *Hitchcock* 16667. Issorora, wet field, *Hitchcock* 17583. Coast Region, *Jenman* 4371*, 4429*, 6261. Lamaha Dam, *Jenman* 6016.

4. Leptochloa domingensis (Jacq.) Trin. Fund. Agrost. 133. 1820.

Cynosurus domingensis Jacq. Misc. Austr. 2: 363. 1781.

Leptostachys domingensis Meyer, Prim. Fl. Esseq. 74. 1818.

Leptochloa virgata gracilis Nees; Griseb. Fl. Brit. W. Ind. 538. 1864.

Leptochloa virgata domingensis Link; Griseb. Fl. Brit. W. Ind. 538. 1864.

Resembling the preceding, but the panicles more elongate and the racemes more numerous.

RANGE: Open ground, Mexico and the West Indies to Brazil and Peru. Original locality not given, presumably Santo Domingo.

SPECIMENS FROM BRITISH GUIANA: Kwaimatta, *Jenman* 5965, 6204.

12. ELEUSINE Gaertn.

Spikelets several to many-flowered, densely imbricate in thick spikes, these subdigitate; glumes and lemmas with thickened 5-nerved keels, acute; caryopsis with a thin pericarp, the seed marked with fine transverse lines.

1. Eleusine indica (L.) Gaertn. Fruct. & Sem. 1: 8. 1788. GOOSE GRASS.

Cynosurus indicus L. Sp. Pl. 72. 1753.

A weedy annual with spreading or ascending flattened, branching culms, thin flat linear blades, and 2 to several spikes (sometimes 1 spike 1 to 3 cm. below) 5 to 10 cm. long.

RANGE: Open ground and waste places. A common weed of warm and warm-temperate regions. Introduced in America; originally described from India.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Promenade Gardens, a weed in flower beds, *Hitchcock* 16577. Penal Settlement, a weed around Colony House, *Hitchcock* 17068. Demerara River, *Jenman* 4370. Coast region, *Jenman* 4379, 4501. Bartica, *Jenman* 6011. Rupununi Savanna, *Melville**.

13. DACTYLOCTENIUM Willd.

Spikelets as in Eleusine, but the glumes and lemmas mucronate or awn-tipped; apex of the rachis extending as a point beyond the spikelets.

1. Dactyloctenium aegyptium (L.) Richt. Pl. Eur. 1: 68. 1890.

Cynosurus aegyptius L. Sp. Pl. 72. 1753.

Dactyloctenium aegyptiacum Willd. Enum. Pl. 1029. 1809.

A weedy, stoloniferous, more or less pilose annual, often forming dense mats, the flat culms 10 to 50 cm. long, the blades flat, usually short, the spikes 2 to 4, short, thick, radiate at the apex of the culm.

RANGE: Open ground and waste places. A common weed in warm countries. Introduced in America; originally described from "Africa, Asia, America."

SPECIMENS FROM BRITISH GUIANA: Georgetown, grassland in park back of sea wall, *Hitchcock* 17660. Coast region, *Jenman* 4439, 4521. Georgetown, behind sea wall, *Jenman* 6345.

14. CAPRIOLA Adans.

(*Cynodon* L. Rich.)

Spikelets 1-flowered, with a prolongation of the rachilla, imbricate in slender digitate spikes; glumes unequal, narrow, acute; lemma broad, boat-shaped, inclosing a palea of equal length.

1. **Capriola dactylon** (L.) Kuntze, Rev. Gen. Pl. **2** : 764. 1891. BERMUDA GRASS.
Panicum dactylon L. Sp. Pl. 58. 1753.
Cynodon dactylon Pers. Syn. Pl. **1**: 85. 1805.

A low, extensively creeping perennial with compressed wiry culms, narrow, usually short blades, and 3 to 5 slender arcuate-spreading spikes 3 to 7 cm. long.

RANGE: Common in open, rather dry ground in the warmer parts of both hemispheres; apparently introduced in America. Originally described from southern Europe. In British Guiana and the British West Indies this is usually called Bahama grass.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, grassland, *Hitchcock* 16722. Demerara River, *Jenman* 4194. Coast lands, *Jenman* 6013. Georgetown, sea wall, *Jenman* 6346. Without locality, *Jenman* 4394.

15. SPARTINA Schreb.

Spikelets 1-flowered, sessile, flattened laterally, densely pectinate in thick, racemosely arranged spikes; glumes unequal, acuminate; lemma and palea obtuse, subequal.

1. **Spartina brasiliensis** Raddi, Agros. Bras. 21. 1823.

Culms erect from extensively creeping rootstocks, mostly a meter or less in height; spikes appressed or suberect, the inflorescence 15 to 20 cm. long, the rachis of the spikes extended as a flexuous bristle.

RANGE: Tidal flats, Guiana to Brazil. Originally described from Rio de Janeiro.

SPECIMENS FROM BRITISH GUIANA: Vreed-en-Hoop, in mud on tidal flat, *Hitchcock* 16721. Plantation Leonora, "Rice Grass," *Bartlett* in 1907. Vryheids Lust, *Bartlett*. Demerara River, estuary, *Jenman* 4393, 5986.

16. GYMNOPOGON Beauv.

Spikelets with 1 perfect floret and 2 or 3 sterile florets, mostly reduced to single awns, above it; glumes equaling or exceeding the florets; fertile lemma narrow, long-awned; spikelets distant or approximate, appressed along a slender axis.

1. **Gymnopogon foliosus** (Willd.) Nees, Agrost. Bras. 426. 1829.
Chloris foliosa Willd. Sp. Pl. **4**: 924. 1806.

A tufted annual, the wiry branching, short-jointed culms ascending (sometimes decumbent at base), 15 to 50 cm. tall, with numerous short, squarrose blades and a subdigitate inflorescence of few to several ascending, delicately awned spikes.

RANGE: White sand barrens or scrubs, West Indies to Brazil. Originally described from St. Thomas.

SPECIMENS FROM BRITISH GUIANA: Wismar, sandy ridge in pure sand, *Hitchcock* 17273. Ituribisci Lake, *Jenman* 2246. Demerara River, *Jenman* 4588. Kwaimatta Savanna, *Jenman* 5993. Rockstone, *Gleason* 531.

17. CHLORIS Swartz.

Spikelets with 1 perfect floret, sessile along a slender rachis forming unilateral spikes, these digitate; glumes unequal; lemma awned or mucronate; rachilla prolonged behind the palea and bearing 1 to few rudimentary awned sterile lemmas.

Plants annual; sterile floret narrow, the apex acute or subacute.
1. C. radiata.

Plants perennial; sterile floret broad, truncate, broadest at the summit.
2. C. polydactyla.

1. Chloris radiata (L.) Swartz, Prodr. Veg. Ind. Occ. 26. 1788.

Agrostis radiata L. Syst. Nat. ed. 10. 2: 873. 1759.

A weedy branching decumbent-ascending annual, the sheaths broad, compressed, the blades thin, flat, or folded, scaberulous or sparsely pilose, the slender spikes somewhat flexuous.

RANGE: Ditches and waste places, southern Mexico and the West Indies to northern South America. Originally described from Jamaica.

SPECIMEN FROM BRITISH GUIANA: New Amsterdam, waste places along road, *Hitchcock* 16833.

2. Chloris polydactyla (L.) Swartz, Prodr. Veg. Ind. Occ. 26. 1788.

Andropogon polydactylon L. Sp. Pl. ed. 2. 1483. 1763.

Culms rather stout, commonly more than 1 meter tall; blades about 1 cm. wide; spikes 5 to 10, pale, usually 8 to 10 cm. long, strongly flexuous.

RANGE: Savannas and grassy slopes, Florida and the West Indies to Brazil. Originally described from Jamaica.

SPECIMEN FROM BRITISH GUIANA: Kwaimatta, *Jenman* in 1894.

18. BOUTELOUA Lag.

Spikelets with 1 perfect floret, and 1 or 2 rudimentary florets above it, in short spikes, these racemose on the main axis; glumes unequal; fertile lemma rather broad, usually 3 to 5-toothed, commonly mucronate or awned; sterile lemmas usually with 3 awns.

1. Bouteloua americana (L.) Scribn. Proc. Acad. Phila. **1891**: 306. 1891.

Aristida americana L. Syst. Nat. ed. 10. 2: 879. 1759.

Bouteloua litigiosa Lag. Gen. & Sp. Nov. 5. 1816.

Bouteloua elatior Griseb. Fl. Brit. W. Ind. 537. 1864.

A tufted perennial, the freely branching flattened wiry culms often 60 or 70 cm. long (sometimes longer), decumbent with ascending ends, the narrow blades mostly involute-pointed, the few to several slender, loosely flowered spikes divergent, rather distant.

RANGE: Open ground, West Indies to Panama and Venezuela. Originally described from Jamaica. Apparently introduced in British Guiana.

SPECIMEN FROM BRITISH GUIANA: Georgetown, park back of sea wall, grassland among Bermuda grass, *Hitchcock* 16835.

19. SPOROBOLUS R. Br.

Spikelets in spikelike or open panicles, awnless; one or usually both glumes shorter than the floret; palea readily splitting; pericarp of the caryopsis loose, the seed readily falling therefrom.

Plants producing numerous creeping rhizomes ..... **1. S. virginicus.**

Plants cespitose, without creeping rhizomes.

Blades flat, pilose and ciliate ..... **2. S. ciliatus.**

Blades folded or involute, slender.

Lower sheaths woolly-villous; second glume nearly as long as the spikelet.
3. S. aeneus.

Lower sheaths not woolly; both glumes much shorter than the spikelet.
4. S. indicus.

1. Sporobolus virginicus (L.) Kunth, Rév. Gram. **1**: 67. 1829.

Agrostis virginica L. Sp. Pl. 63. 1753.

Culms 15 to 40 cm. tall, erect from extensively creeping, hard, scaly rhizomes, the numerous leaves conspicuously distichous, the sheaths overlapping, the blades firm, involute-pointed; panicles spikelike, commonly not over 5 cm. long.

Extensive colonies of sterile plants often found along sandy beaches.

RANGE: Saline soil along the coast, Virginia to Brazil. Originally described from Virginia.

SPECIMENS FROM BRITISH GUIANA: New Amsterdam, brackish meadow, *Hitchcock* 16831. Georgetown, along road by sea wall, *Hitchcock* 16834. Demerara, near the seashore, *Jenman* 4524, 5992, 6043*, 6416*.

2. Sporobolus ciliatus Presl, Rel. Haenk. **1**: 242. 1830.

Culms 10 to 30 cm. tall, the leaves mostly toward the base; blades rather stiff, mostly 5 to 10 cm. long, as much as 5 mm. wide; panicle spikelike, somewhat interrupted.

RANGE: Open ground, Mexico to Brazil. Originally described from Panama.

SPECIMENS FROM BRITISH GUIANA: Horeabea Savanna, *Jenman* 3748. Demerara River, *Jenman* 4506.

3. Sporobolus aeneus (Trin.) Kunth. Rév. Gram. **1**: Suppl. xvii. 1830.

Vilfa aenea Trin. Gram. Icon. **1**: *pl. 23*. 1826.

Sporobolus cubensis Hitchc. Contr. U. S. Nat. Herb. **12**: 237. 1909.

Plants in dense bunches with numerous innovations; culms 30 to 60 cm. tall, the basal sheaths (especially of the innovations) woolly or villous; blades long and narrow, firm, folded; panicle narrow but open, the branches ascending, more or less whorled; spikelets 3 mm. long, the first glume about half as long.

RANGE: Sandy barrens, Cuba to Brazil, whence originally described.

SPECIMENS FROM BRITISH GUIANA: Wiruni-Ituni Savanna, County Berbice (Cattle-trail Survey), *Abraham* 8. Orealla, Courantyne River, *Jenman* 47.

4. Sporobolus indicus (L.) R. Br. Prodr. Fl. Nov. Holl. **1**: 170. 1810.

Agrostis indica L. Sp. Pl. 63. 1753.

Sporobolus jacquemontii Kunth, Rév. Gram. **2**: 427. *pl. 127*. 1831.

Culms erect, 0.6 to 1 meter tall, in large clumps with numerous leafy shoots at the base; panicle 15 to 30 cm. long, the slender branches ascending, the short-pediceled spikelets mostly borne along the lower side.

RANGE: Common in grassland, West Indies and Mexico to Brazil. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, grassland, *Hitchcock* 16581. Coast region, *Jenman* 2167*, 6010, 6033*. Lamaha, *Jenman* 3820*. Georgetown, Botanic Gardens, rice field, *Kartright* in 1912.

20. ARISTIDA L.

Spikelets in close or open panicles; glumes acuminate; lemma convolute, subindurate with a pointed callus and bearing from the apex a trifid awn.

1. Aristida capillacea Lam. Tabl. Encycl. **1**: 156. 1791.

Aristida elegans Rudge, Pl. Guian. 22. *pl. 30*. 1805.

Plants annual, tufted; culms delicate, 10 to 20 cm. tall; panicles narrow but somewhat open; fruit (excluding awns) 3 mm. long, the awns equal, about 5 mm. long.

RANGE: Open ground, southern Mexico to Brazil. Originally described from tropical America.

SPECIMENS FROM BRITISH GUIANA: Savannas, *Jenman* 7280*. Mt. Roraima, *Loyed* 12*. Without locality, *Schomburgk* 799.

An immature unidentified species of *Aristida* was collected on the Canje River by Jenman (nos. 1899*, 1900*). The two specimens may belong to different species. They are both rather stout perennials, one with involute blades, the other with flat blades.

21. ORYZA L.

Spikelets perfect, paniculate, laterally compressed; glumes minute; lemma and palea subindurate, papillose-roughened, the lemma awned (the awn sometimes obsolete).

1. **Oryza sativa** L. Sp. Pl. 333. 1753. RICE.

The cultivated rice is occasionally spontaneous.

SPECIMENS FROM BRITISH GUIANA: Rupununi Savanna, *Melville*. Pomeroon River, *Stockdale* in 1909.

22. HOMALOCENCHRUS Mieg.

(*Leersia* Swartz.)

Spikelets awnless, the glumes wanting, otherwise as in *Oryza*, the plants and spikelets much smaller.

1. **Homalocenchrus hexandrus** (Swartz) Kuntze, Rev. Gen. Pl. 2: 777. 1891.

Leersia hexandra Swartz, Prodr. Veg. Ind. Occ. 21. 1788.

A scabrous aquatic perennial, the slender culms 30 to 50 cm., or sometimes more than 1 meter tall, erect from a creeping base, the flat blades mostly 15 to 20 cm. long and about 8 mm. wide, the many-flowered panicle pale or purplish.

Extensively creeping stolons with short blades are sometimes produced in land bordering ponds and ditches.

RANGE: Swamps and ditches, southern United States to Uruguay. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, in water or mud along canal, *Hitchcock* 16547. Lamaha Canal, *Bartlett* in 1907. Coast regions, *Jenman* 2203, 4433, 4516, 4543, 4544, 6018*. Lamaha Canal, *Jenman* 3685, 4557*. Horenbea, *Jenman* 4452.

23. LUZIOLA Gmel.

Pistillate and staminate spikelets in separate panicles; glumes wanting; caryopsis with a thick, hard pericarp.

1. **Luziola spruceana** Benth.; Doell in Mart. Fl. Bras. 2[2]: 18. 1871.

Culms thick, soft and spongy, freely branching; sheaths broad, with long, erect auricles; staminate panicles terminal; pistillate panicles terminal and axillary, corymbose, the numerous branches reflexed at maturity.

RANGE: Ponds and lagoons, Cuba to Brazil, whence originally described.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, in water of canal, *Hitchcock* 16537. Coast regions, *Jenman* 1745, 4420, 4494. Demerara River, *Jenman* 4197*. Also *Meyer*, fragment from specimen in the Trinius Herbarium labeled "*Luziola peruviana* Pers. F. Esseq."

24. PHARUS L.

Spikelets in pairs, appressed along the slender, spreading, nearly simple panicle branches, one pistillate, subsessile, the other staminate, pedicellate, much smaller than the pistillate spikelet; fertile lemma subindurate, terete, clothed (at least toward the beaked apex) with thick uncinate hairs; blades with fine transverse veins between the longitudinal nerves, petioled (the petiole

with a single twist reversing the upper and under surfaces of the blade), the nerves running from midnerve to margin.

1. **Pharus latifolius** L. Syst. Nat. ed. 10. **2**: 1269. 1759.

An erect glabrous perennial 50 to 75 cm. tall, with flat oblanceolate acuminate blades commonly 15 to 25 cm. long and 4 to 6 cm. wide, and large, open, fragile panicles, the few branches stiffly ascending or spreading, the appressed, oblong, brown spikelets 12 to 15 mm. long, the fruit pubescent at tip with hooked hairs; panicles readily breaking up, the pieces attaching themselves by the hooked hairs to passing objects.

RANGE: Rich woods, West Indies to Brazil. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Kartabo, rich forest along edge of clearing, *Hitchcock* 17205. Kwaimatta, *Jenman* 6045*.

25. **ARUNDINELLA** Raddi.

Spikelets short-pedicellate in large panicles; glumes acuminate, the tips widely spreading, the second longer than the first and the sterile lemma; fertile lemma minute, bearded on the callus, bearing a long, slender awn from the apex.

1. **Arundinella hispida** (Willd.) Kuntze, Rev. Gen. Pl. **2**: 761. 1891.

Andropogon hispidus Humb. & Bonpl.; Willd. Sp. Pl. **4**: 908. 1806.

Ischaemum hispidum H. B. K. Nov. Gen. & Sp. **1**: 194. 1816; Kunth, Rév. Gram. *pl. 100*. 1830.

Arundinella brasiliensis Raddi, Agrost. Bras. 37. 1823.

A tall, reedlike perennial with hispid sheaths and blades and condensed panicles 5 to 15 cm. long, the numerous branches ascending, 4 to 6 cm. long; spikelets about 3 mm. long, the awn geniculate and twisted, exserted 1 to 2 mm. at one side.

RANGE: Savannas, Guiana to Brazil, whence originally described.

SPECIMEN FROM BRITISH GUIANA: Mt. Roraima, "our house," *Im Thurn* 254.

26. **LEPTOCORYPHIUM** Nees.

Spikelets in narrow panicles; first glume wanting; sterile lemma empty, this and the second glume hairy; fertile lemma and palea brown, with a white hyaline, somewhat lacerate or ciliate summit, open at maturity.

1. **Leptocoryphium lanatum** (H. B. K.) Nees, Agrost. Bras. 84. 1829.

Paspalum lanatum H. B. K. Nov. Gen. & Sp. **1**: 94. *pl. 29*. 1816.

Anthaenantia lanata Benth. Journ. Linn. Soc. Bot. **19**: 39. 1881.

A slender, erect, unbranched, tufted perennial up to 1 meter tall, with long, narrow, often involute blades and loose, many-flowered, oblong panicles with capillary branchlets and silky-pilose spikelets, the hairs at first appressed, at maturity spreading.

RANGE: Dry hills and savannas, West Indies and southern Mexico to Uruguay. Originally described from Mexico.

SPECIMEN FROM BRITISH GUIANA: Wiruni-Ituni Savannas, County Berbice (Cattle-trail Survey), *Abraham* 40.

27. **VALOTA** Adans.

Spikelets in pairs, short-pedicellate in 2 rows along one side of a narrow rachis, the slender racemes aggregate in a narrow or flabellate panicle; spikelets lanceolate, clothed with long, silky hairs; first glume minute; fruit acuminate, brown with broad white hyaline margins.

Panicle narrow, the branches erect or ascending; spikelets densely clothed with tawny or brown silky hairs much exceeding the spikelet__1. V. insularis.
Panicle open, the slender branches widely spreading; spikelets sparsely villous, the hairs shorter than the spikelets_____2. V. laxa.

1. **Valota insularis** (L.) Chase, Proc. Biol. Soc. Washington **19**: 188. 1906.

Andropogon insularis L. Syst. Nat. ed. 10. **2**: 1304. 1759.
Panicum lanatum Rottb. Act. Lit. Univ. Hafn. **1**: 269. 1778.
Panicum leucophaeum H. B. K. Nov. Gen. & Sp. **1**: 97. 1816.
Panicum insulare Meyer, Prim. Fl. Esseq. 60. 1818.
Trichachne insularis Nees, Agrost. Bras. 86. 1829.
Tricholaena insularis Griseb. Abh. Ges. Wiss. Göttingen **7**: 265. 1857.

A rather coarse, tufted, weedy perennial, with sparsely hirsute sheaths, flat, usually scabrous blades, and silky panicles tawny at maturity.

RANGE: Open ground and waste places in the tropics and subtropics of America at low altitudes. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Mahaica, in field near coast, *Hitchcock* 16768. Rupununi Savanna, *Melville**. Also *Meyer*, a fragment from a specimen in the Trinius Herbarium labeled "Fl. Esseq."

2. **Valota laxa** (Reichenb.) Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 292. 1917.

Reimaria laxa Reichenb.; Spreng. Tent. Suppl. Syst. Veg. 2. 1828.
Trichachne recalva Nees, Agrost. Bras. 88. 1829.

Culms 1 to 2 meters tall, decumbent at base; sheaths tuberculate-hispid; panicle large and open.

The stiff hairs of the sheaths break off in handling and penetrate the skin.

RANGE: Open moist ground, southern West Indies to Paraguay. Originally described from Surinam [Dutch Guiana].

SPECIMENS FROM BRITISH GUIANA: Parika, moist low ground among shrubs, *Hitchcock* 16757. Demerara River, *Jenman* 4185. Lamaha Canal, No. 1 Benab, *Jenman* 4561. Lamaha Dam, *Jenman* 6017*.

28. SYNTHERISMA Walt.

(*Digitaria* Hall.)

Spikelets in twos or threes, short-pedicellate in two rows along one side of a narrow rachis, the slender racemes digitate or subdigitate; spikelets lanceolate or elliptic; first glume minute or obsolete; fruit acute, the hyaline margins of the lemma narrow.

Rachis of racemes winged on the margins, the green wing on each side as wide as the whitish center.
Spikelets about 3 mm. long; sheaths pilose_____1. S. sanguinalis.
Spikelets about 1.5 mm. long; sheaths glabrous.
Stems creeping. Racemes mostly 2_____6. S. longiflora.
Stems erect, or somewhat geniculate at base_____5. S. chinensis.
Rachis of racemes not winged; that is, the green margins narrower than the central part.
Rachis of racemes beset with scattered long hairs, spreading; sheaths pilose_____2. S. digitata.
Rachis of racemes without long hairs.
Sheaths velvety pubescent; racemes approximate or connivent, not spreading_____3. S. malacophylla.
Sheaths glabrous or the lower puberulent; racemes ascending, loosely approximate_____4. S. cuyabensis.

1. Syntherisma sanguinalis (L.) Dulac, Fl. Haut. Pyr. 77. 1867. CRABGRASS.

Panicum sanguinalis L. Sp. Pl. 57. 1753.

Digitaria sanguinalis Scop. Fl. Carn. ed. 2. 1: 52. 1772.

Digitaria marginata Link, Enum. Pl. 1: 102. 1821.

Digitaria fimbriata Link, Hort. Berol. 1: 226. 1827.

A decumbent branching weedy grass with pilose sheaths, flat blades, and 5 to 10 racemes in 1 or 2 whorls; spikelets 3 mm. long, the nerves more or less silky-pubescent.

RANGE: A common weed in cultivated soil and waste places throughout the temperate and tropical regions of both hemispheres. Originally described from America and southern Europe.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Promenade Gardens, a weed in flower beds, *Hitchcock* 16576. Rockstone, a weed along railroad, *Hitchcock* 17327. Coast lands, *Jenman* 4373*, 6036½.

2. Syntherisma digitata (Swartz) Hitchc. Contr. U. S. Nat. Herb. **12**: 142. 1908.

Milium digitatum Swartz, Prodr. Veg. Ind. Occ. 24. 1788.

Digitaria horizontalis Willd. Enum. Pl. 92. 1809.

Digitaria setigera Roth; Roem. & Schult. Syst. Veg. **2**: 474. 1817.

Digitaria setosa Desv.; Hamilt. Prodr. Pl. Ind. Occ. 6. 1825.

Similar to the preceding, but the racemes more slender, averaging more numerous; spikelets narrow, about 2.3 mm. long, the nerves glabrous or nearly so; rachis of racemes beset with scattered long hairs, these glistening when moist with dew.

RANGE: A common weed in fields, open ground, and waste places, tropical regions of both hemispheres. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, a weed, *Hitchcock* 16603. Kyk-over-al Island, a weed, *Hitchcock* 17200. Tumatumari, *Hitchcock* 17344; *Gleason* 43. Akyma, *Hitchcock* 17436. Morawhanna, a weed in the grounds of Commissioner King, *Hitchcock* 17474. Essequibo River, *Jenman* 1092*. Coast region, *Jenman* 1511*, 4545, 6036. Upper Demerara River, *Jenman* 4108, 4111. Also *Meyer*, a fragment from a specimen in the Trinius Herbarium labeled "Fl. Esseq."

3. Syntherisma malacophylla Hitchc., sp. nov. FIG. 79.

Plants annual; culms erect, glabrous, or the lower internodes pilose, 50 to 100 cm. tall; sheaths softly and densely pilose, the uppermost glabrous; ligule a thin brownish membrane about 2 mm. long; blades flat, spreading, 10 to 15 cm. long, 5 to 8 mm. wide, softly pubescent on both surfaces, the uppermost glabrous; inflorescence long-exserted; racemes about 10 to 12, 10 to 15 cm. long, erect, the axis 3 to 4 cm. long; rachis of the racemes angled, the margin scabrous, much narrower than the white center; spikelets about 2.5 mm. long, the longer pedicel of the pair angled, 1 to 2 mm. long; first glume obsolete; second glume as long as the spikelet, 5-nerved, a little silky on the margin and along the lower part; sterile lemma similar to the second glume, 7-nerved, the 3 nerves on each side close together near the margin, appressed silky-villous; fertile lemma pale, apiculate, as long as the spikelet.

Type in the U. S. National Herbarium, no. 1,038,515, collected in nearly pure sand along the railroad at Rockstone, British Guiana, December 31, 1919, by A. S. Hitchcock (no. 17284).

Known only from the type collection.

FIG. 79.—*Syntherisma malacophylla.* From the type specimen.

4. Syntherisma cuyabensis (Trin.) Hitchc.

Panicum cuyabense Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. **1**: 206. 1834.

A spreading annual, with culms as much as 1 meter long; sheaths glabrous or the lower pubescent; blades flat, more or less scabrous or pubescent; spikes several or numerous, ascending, aggregate near the summit but not digitate, slender, as much as 10 cm. long, the rachis scarcely winged, naked; spikelets about 2.5 mm. long, narrowly lanceolate, short-pubescent on the nerves, the first glume obsolete, the second as long as the spikelet.

RANGE: Sandy soil, Guiana to Argentina. Originally described from Brazil.

SPECIMEN FROM BRITISH GUIANA: Rockstone, *Gleason* 636.

5. Syntherisma chinensis (Nees) Hitchc.

Paspalum chinensis Nees in Hook. & Arn. Bot. Beechey Voy. 231. 1841.

Paspalum minutiflorum Steud. Syn. Pl. Glum. **1**: 17: 1854. Not *P. minutiflorum* Desv. 1831.

Syntherisma helleri Nash, Minn. Bot. Stud. **1**: 798. *pl. 44.* 1897.

A slender, tufted, erect or ascending annual, leafy below, with flat glabrous blades and 2 to several very slender, usually arcuate racemes of minute pale spikelets obscurely silky in the internerves.

In Grasses of the West Indies[9] this species was listed as *S. longiflora.*

RANGE: Grassland and open ground, southern Asia, now spread to tropical regions generally. Originally described from China.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, grassland near canal, *Hitchcock* 16548. Akyma, a weed in fields, *Hitchcock* 17437.

6. Syntherisma longiflora (Retz.) Skeels, U. S. Dept. Agr. Bur. Pl. Ind. Bull. 261: 30. 1912.

Paspalum longiflorum Retz. Obs. Bot. **4**: 15. 1786.

Digitaria longiflora Pers. Syn. Pl. **1**: 85. 1805.

Stems creeping, the fertile culms 10 to 15 cm. tall; blades short and spreading, mostly 10 to 15 mm. long; racemes mostly 2-conjugate at summit, 2 to 3 cm. long; spikelets scarcely 1.5 mm. long.

RANGE: Open clay bank, southern Asia and Polynesia; introduced in British Guiana. Originally described from India.

SPECIMEN FROM BRITISH GUIANA: Hills Estate near Bartica, clay bank beside road, *Hitchcock* 17193.

29. STENOTAPHRUM Trin.

Spikelets 1 to 3 together, embedded in cavities along one side of a broad, flat, thickened, corky, articulate axis, the spikelets falling attached to the joints; spikelets strongly convex on the inner side; first glume minute.

1. Stenotaphrum secundatum (Walt.) Kuntze, Rev. Gen. Pl. **2**: 794. 1891.

Ischaemum secundatum Walt. Fl. Carol. 249. 1788.

Stenotaphrum americanum Schrank, Pl. Rar. Hort. Monac. *pl. 98.* 1820.

Stenotaphrum glabrum var. *americanum* Doell in Mart. Fl. Bras. **2**[3]: 300. 1877.

An extensively creeping glabrous perennial, the stolons with long internodes and short, leafy branches, the sheaths equitant, the blades short, obtuse; flowering culms 10 to 30 cm. tall, the blades commonly 10 to 15 cm. long; spikes terminal and axillary, 5 to 10 cm. long.

RANGE: Open grassland, at low altitudes, especially near the coast, southern United States to southern Brazil. Originally described from South Carolina.

SPECIMENS FROM BRITISH GUIANA: New Amsterdam, grassy places at rear of mangroves, *Hitchcock* 16821. Without locality, *Jenman* 6019*, 7510.

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[9] Contr. U. S. Nat. Herb. **18**: 294. 1917.

An excellent pasture grass. Called St. Augustine grass in the southern United States, where it is used for lawns. In British Guiana sometimes called sheep grass.

30. ECHINOLAENA Desv.

Spikelets tuberculate-hispid, laterally compressed, pectinately arranged in a single, 1-sided, inflexed, spikelike raceme terminating the main culm and the branches; first glume longer than the second.

1. **Echinolaena inflexa** (Poir.) Chase, Proc. Biol. Soc. Washington **24**: 117. 1911.

Cenchrus inflexus Poir. in Lam. Encycl. **6**: 50. 1804.
Cenchrus marginalis Rudge, Pl. Guian. 19. *pl. 25*. 1805.
Echinolaena hirta Desv. Journ. de Bot. Desv. **1**: 75. 1813.
Echinolaena scabra H. B. K. Nov. Gen. & Sp. **1**: 118. *pl. 38*. 1816.
Panicum echinolaena Nees, Agrost. Bras. 128. 1829.

A much-branched decumbent and straggling perennial, the stiff branches erect; blades firm, smooth, 4 to 6 cm. long; raceme 2 to 3 cm. long, usually bent at right angles, the upper spikelet extending forward as a continuation of the rachis.

RANGE: Moist open ground, Guiana to Brazil. Originally described from Cayenne.

SPECIMENS FROM BRITISH GUIANA: Lama Stop-off, shady bank of canal, *Hitchcock* 16898; *Bartlett* 8108. Spencers Landing, County Berbice (Cattle-trail Survey), *Abraham* 173. Mt. Roraima, "our house," *Im Thurn* 154. Canje River, *Jenman* 1901*. Lama Savanna, *Jenman* 5974. Without locality, *Schomburgk* 646.

31. PSEUDECHINOLAENA Stapf.

Spikelets loosely arranged in several erect or ascending racemes, the second glume about as long as the spikelet, uncinate-spiny and ventricose at maturity.

1. **Pseudechinolaena polystachya** (H. B. K.) Stapf in Prain, Fl. Trop. Afr. **9**: 495. 1919.

Echinolaena polystachya H. B. K. Nov. Gen. & Sp. **1**: 119. 1816.
Panicum uncinatum Raddi, Agrost. Bras. 41. 1823.

Plants creeping and rooting at base, the fertile culms erect or ascending, 20 to 40 cm. tall; blades thin, elliptic, 3 to 6 cm. long; racemes 2 to 3 cm. long.

RANGE: Moist, shady soil, southern Mexico to Bolivia and Uruguay. Originally described from Colombia.

SPECIMEN FROM BRITISH GUIANA: Without locality, *Schomburgk* 588.

32. ERIOCHLOA H. B. K.

Inflorescence of few to many racemes along a common axis; spikelets subsessile, solitary, the back of the fruit turned from the slender rachis; internode of the rachilla between the first and second glumes thickened, forming a ring-like base to the spikelet, the first glume usually reduced to an obscure sheath adnate to the ring; fruit minutely papillose-rugose, mucronate-pointed or with a delicate, often deciduous awn.

Spikelets acute; first glume present ..... 1. E. subglabra.
Spikelets long-acuminate; first glume obsolete.
  Fruit tipped with a slender awn 1 mm. long; spikelets 4 to 5 mm. long. ..... 2. E. punctata.
  Fruit merely apiculate; spikelets 3 mm. long ..... 3. E. ramosa.

1. **Eriochloa subglabra** (Nash) Hitchc. Contr. U. S. Nat. Herb. **12**: 208. 1909.
Monachne subglabra Nash, Bull. Torrey Club **30**: 374. 1903.

A stoloniferous perennial with erect flowering culms 1 to 2 meters tall, bearded nodes, flat spreading blades, and terminal panicles of several to many loosely ascending or spreading branches, the spikelets usually in pairs.

RANGE: Moist ground, swamps, and ditches, West Indies to Brazil. Originally described from Porto Rico.

SPECIMEN FROM BRITISH GUIANA: Bartica, sandy bank of Essequibo River, *Hitchcock* 17265.

2. **Eriochloa punctata** (L.) Desv.; Hamilt. Prodr. Pl. Ind. Occ. 5. 1825.
Milium punctatum L. Syst. Nat. ed. 10. **2**: 872. 1759.

Plants perennial, branching; culms erect, as much as 1 meter tall or more; blades up to 15 mm. wide; panicles with several erect or ascending racemes; spikelets silky.

RANGE: Swamps and ditches, southern United States, through the West Indies and eastern Mexico to Brazil. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, a weed in Botanic Gardens, *Hitchcock* 16612. Peters Hall, among brush near river, *Hitchcock* 16669, 16675, 16676. Parika, savanna, *Hitchcock* 16801. Mackenzie, moist grassland, *Hitchcock* 17454. Morawhanna, a weed in the grounds of Commissioner King, *Hitchcock* 17473. Coast region, *Jenman* 2168*, 4374*, 4378, 4430, 4514*. Lama Savanna, *Jenman* 5995, 5996.

3. **Eriochloa ramosa** (Retz.) Kuntze, Rev. Gen. Pl. **2**: 775. 1891.
Milium ramosum Retz. Obs. Bot. **6**: 22. 1791.
Eriochloa annulata Kunth, Rév. Gram. **1**: 30. 1829.

A slender ascending glabrous annual with sparingly branching culms, linear blades 2 to 5 mm. wide, and pale panicles of few to several erect or ascending racemes; spikelets silky.

RANGE: Introduced in British Guiana and Cuba. Originally described from India.

SPECIMEN FROM BRITISH GUIANA: Georgetown, moist open ground, *Hitchcock* 16574.

33. AXONOPUS Beauv.

Inflorescence of 2 to many slender racemes, aggregate at the summit of the culm; spikelets depressed-biconvex, oblong-elliptic, solitary, subsessile, the back of the fruit turned from the rachis; first glume wanting; sterile palea obsolete.

Rachis bearing conspicuous stiff spreading golden hairs (Section CABRERA).

1. A. aureus.

Rachis not bearing stiff hairs (AXONOPUS proper).

Plants annual. Racemes 2 or 3, delicate ---------- 2. A. capillaris.

Plants perennial.

Spikelets 2.5 to 3 mm. long.

Racemes few; spikelets about 3 mm. long, nearly smooth.

3. A. leptostachyus.

Racemes numerous; spikelets about 2.5 mm., appressed-silky.

4. A. scoparius.

Spikelets 2 mm. or less long.

Culms erect in large bunches, 50 to 100 cm. tall, without stolons.

5. A. attenuatus.

Culms creeping or stoloniferous.

Blades averaging more than 5 mm. wide; spikelets 2 mm. long.

6. A. compressus.

Blades mostly less than 3 mm. wide; spikelets less than 2 mm. long.

7. A. stragulus.

1. Axonopus aureus Beauv. Ess. Agrost. 12, 154. 1812.

Paspalum exasperatum Nees, Agrost. Bras. 81. 1829.

Panicum chrysites Steud. Syn. Pl. Glum. 1: 38. 1854.

A tall, slender, branching perennial with wiry, compressed culms, rather firm spreading flat blades, and a handsome inflorescence of 4 to 15 subdigitate, slender, golden-brown racemes, the stiff orange-yellow hairs in tufts below the spikelets, as well as along the margins.

RANGE: Wet, sandy savannas, Porto Rico and Trinidad to Brazil. Type locality not indicated in the original description.

SPECIMEN FROM BRITISH GUIANA: Yawakuri Savanna, County Berbice (Cattle-trail Survey), *Abraham* 143.

2. Axonopus capillaris (Lam.) Chase, Proc. Biol. Soc. Washington **24**: 133. 1911.

Paspalum capillare Lam. Tabl. Encycl. 1: 176. 1791.

A slender, ascending, branching, nearly glabrous annual, with thin blades 2.5 to 5 cm. long and about 4 mm. wide and with 2 or 3 delicate racemes about 2.5 cm. long, on long subcapillary peduncles.

RANGE: Moist open ground, Central America to Peru and Brazil. Originally described from tropical America.

SPECIMENS FROM BRITISH GUIANA: Wismar, sandy soil, *Hitchcock* 17276. Hills Estate near Bartica, sandy soil, *Hitchcock* 17192. Rockstone, sandy soil, *Hitchcock* 17299; *Gleason* 6361/2 (herb. N. Y. Bot. Gard.).

3. Axonopus leptostachyus (Flügge) Hitchc.

Paspalum leptostachyum Flügge, Monogr. Pasp. 123. 1810.

Culms erect, branching, as much as 1 meter tall; blades up to 1 cm. wide; racemes mostly 4 to 6 from the main culm, fewer from the branches, as much as 20 cm. long, erect or ascending; spikelets 3 mm. long.

RANGE: Moist open ground, Venezuela to Brazil. Originally described from Venezuela.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, wet sand along river, *Hitchcock* 17114. Bartica, bank of Essequibo River, *Hitchcock* 17162, 17264; *Jenman* 6028. Tumatumari, in partial shade near river, *Hitchcock* 17364. Potaro, new land made by gold dredge, *Hitchcock* 17408. Rupununi Savanna, *Melville**.

4. Axonopus scoparius (Flügge) Hitchc.

Paspalum scoparium Flügge, Monogr. Pasp. 124. 1810.

An erect perennial a meter or more tall, with hispidulous sheaths, flat, glabrous or hispidulous blades 5 to 20 mm. wide, and numerous slender, erect or ascending racemes 10 to 20 cm. long, aggregate toward the summit of the culm; spikelets 2.5 to 3 mm. long, appressed short-villous.

RANGE: Savannas, Colombia to Ecuador and Brazil. Originally described from tropical America.

SPECIMEN FROM BRITISH GUIANA: Without locality, *Schomburgk* 721.

5. Axonopus attenuatus (Presl) Hitchc.

Paspalum attenuatum Presl, Rel. Haenk. 1: 212. 1830.

Culms numerous in large bunches, erect, 50 to 100 cm. tall, the shoots much compressed; sheaths numerous, overlapping, strongly keeled, passing insensibly into the folded blade; racemes slender, numerous, as many as 20, somewhat scattered for 4 to 5 cm., mostly 7 to 10 cm. long; spikelets about 1.5 mm. long.

The rather stiff and fragile shoots are conspicuously compressed and distichous.

RANGE: Sand scrub and sandy savannas, Guiana to Peru and Brazil. Originally described from Peru.

SPECIMENS FROM BRITISH GUIANA: Head of Horeabea Creek, sandy savanna, *Hitchcock* 16940. Sand scrub between Wismar and Rockstone, *Hitchcock* 17275, 17285. County Berbice (Cattle-trail Survey), "growing sparsely on high plateau composed of white sand," *Abraham* 246. Potaro River, Kaieteur Savanna, *Jenman* 1069*.

6. Axonopus compressus (Swartz) Beauv. Ess. Agrost. 12, 154. 1812.

CARPET GRASS.

Milium compressum Swartz, Prodr. Veg. Ind. Occ. 24. 1788.
Paspalum platicaulon Poir. in Lam. Encycl. Suppl. 5: 34. 1804.
Paspalum compressum Raspail, Ann. Sci. Nat. 5: 301. 1825.
Anastrophus compressus Schlecht.; Doell in Mart. Fl. Bras. 2²: 102. 1877.

A nearly glabrous perennial, under favorable conditions producing long leafy stolons with short broad obtuse blades, the flowering culms erect or ascending, compressed, with rather thin blades 8 to 10 mm. wide, and 2 to 5 slender racemes along a short axis, 2 or 3 secondary peduncles often produced from the upper node.

This species is exceedingly variable in habit; in dry ground it sometimes has blades not over 2 or 3 mm. wide.

RANGE: Moist grassland, southern United States to Argentina; also in the warmer parts of the Old World. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, sandy ground, *Hitchcock* 17066, 17101. Wismar, sandy soil, *Hitchcock* 17277. Rupununi Savanna, *Melville*. Also *Meyer*, a fragment from a specimen in the Trinius Herbarium labeled "*Paspalum platicaule* Poir. Fl. Esseq."

This species is an important constituent of grassland in the lowland of British Guiana and is an excellent forage grass.

7. Axonopus stragulus Chase, sp. nov. FIG. 80.

Plants perennial, forming small dense mats with slender, freely branching stolons as much as 40 cm. long, rooting at the nodes, the internodes strongly flattened, the leaves not noticeably different from those of the flowering culms; flowering culms erect or ascending, often geniculate, 10 to 30 cm. tall, flattened, glabrous, with 1 or 2 slender leafless flowering branches from the upper nodes, the uppermost joints elongate and very slender; nodes appressed-pubescent or glabrous; sheaths usually longer than the internodes but commonly somewhat spreading, exposing the nodes, compressed, keeled, ciliate on the margin, the hairs at the summit as much as 2 mm. long, otherwise glabrous or occasionally sparsely pilose; ligule minute, ciliate; blades erect or slightly divergent, folded at the base or throughout, about as wide as the sheath at base, 2 to 10 cm. long, 2 to 3 mm. wide, the apex carinate, sparsely papillose-pilose on the margin at least toward the base; racemes 2 to 4 (commonly 3), subdigitate, slender, suberect or slightly spreading, 3 to 6 cm. long; rachis about 0.5 mm. wide, flexuous, glabrous; spikelets not at all imbricate, pale, 1.8 mm. long, about 0.7 mm. wide, oblong-elliptic; glume and sterile lemma equal, covering the fruit but not exceeding it, 4-nerved (the midnerve suppressed), the lateral nerves adjacent and near the margin, with a thin band of long appressed silky hairs either side of each pair, this pubescence often obscure, sometimes wanting; fruit pale stramineous, minutely pubescent at the apex.

Type in the U. S. National Herbarium, no. 1,038,951, collected in open, sandy, moist soil along road through forest, near the Penal Settlement, on the west side of Essequibo River, near the mouth of Mazaruni River, British Guiana, December 3, 1919, by A. S. Hitchcock (no. 17065).

Related to *Axonopus compressus* (with which it was found growing), from which it is distinguished by its much more slender habit, by the nearly conform

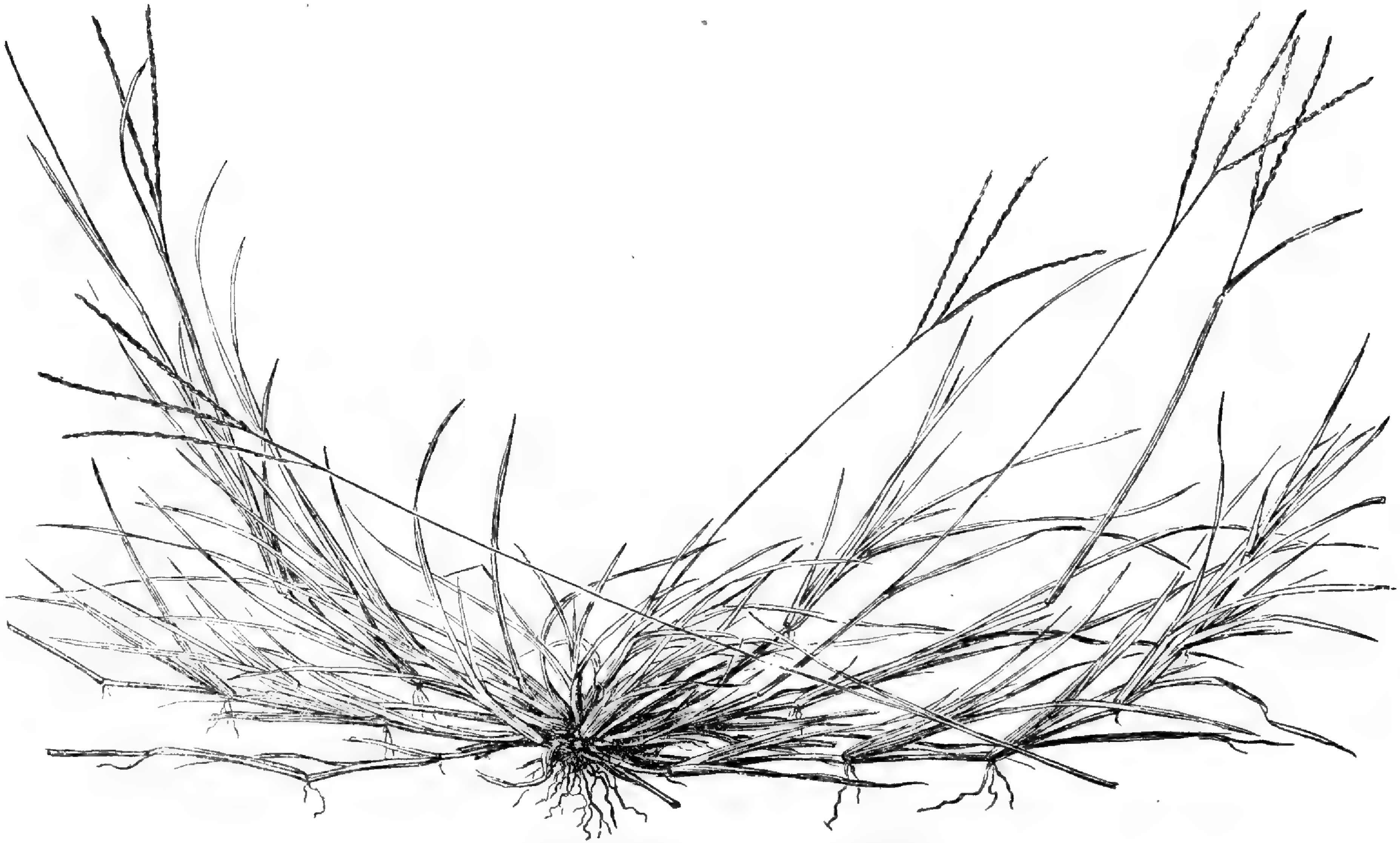

FIG. 80.—*Axonopus stragulus*. From the type specimen.

foliage of the stolons and fertile culms, by the smaller, less pubescent spikelets, the glume and sterile lemma not pointed beyond the fruit. This may be *Paspalum platycaulon parviflorum* Doell,[10] described from Cayenne.

RANGE: Known only from near the junction of the Mazaruni and Essequibo rivers.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, moist sandy soil, *Hitchcock* 17065; open shrubby ground, *Hitchcock* 17245; rocks near river, *Hitchcock* 17246. Bartica, *Jenman* 6027.

34. PASPALUM L.

Inflorescence of 1 to many racemes, these conjugate or racemose along a common axis; spikelets plano-convex, subsessile along a slender or winged rachis, the back of the fruit turned toward it; first glume typically wanting, present in a few species; fertile lemma and palea chartaceous-indurate.

Rachis with broad membranaceous wings more or less infolding the spikelets.
  Racemes numerous; spikelets glabrous or minutely pubescent---1. **P. repens.**
  Racemes 1 or 2; spikelets pilose.
    Raceme 1; spikelets silky; blades involute----------2. **P. carinatum.**
    Racemes 2; spikelets papillose-ciliate; blades flat-------3. **P. pectinatum.**
Rachis without broad membranaceous wings.
  Spikelets with a broad, stiff lacerate margin----------4. **P. fimbriatum.**
  Spikelets not lacerate-margined.
    Racemes 2, conjugate, or approximately so, at the summit of the culm, rarely a third below.
      Spikelets elliptic or narrowly ovate.
        Second glume and sterile lemma glabrous----------5. **P. vaginatum.**
        Second glume pubescent----------6. **P. distichum.**
      Spikelets suborbicular, broadly ovate, or obovate.
        Spikelets sparsely long-silky around the margin. Plants stoloniferous.
          7. P. conjugatum.
        Spikelets not silky-margined.
          Spikelets 1.5 mm. long, some of them sprinkled with globular hairs.
            8. P. multicaule.
          Spikelets 1.8 to 2.3 mm. long, glabrous.
            Spikelets golden-brown, transversely marked with wavy dark lines.
              9. P. serpentinum.
            Spikelets green or pale, not marked----------10. **P. pumilum.**
    Racemes 1 to many, racemose or fascicled on the axis, not conjugate, sometimes some of them in two's but not regularly so.
      Second glume wanting. Sterile lemma dark crimson--11. **P. pulchellum.**
      Second glume present.
        First glume present on at least one of the pair of spikelets.
          12. P. decumbens.
        First glume normally wanting (rarely present on occasional spikelets).
          Fruit dark brown and polished. Spikelets glabrous; racemes several; plants annual----------14. **P. melanospermum.**
          Fruit not dark brown and polished.
            Racemes 1 to 3, rarely more.
              Spikelets 2 mm. long. Racemes 1 or 2---------13. **P. nutans.**

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[10] In Mart. Fl. Bras. **2**[2]: 102. 1877.

Spikelets a little over 1 mm. long.
Blades mostly 1 to 3 cm. long; racemes mostly less than 15 mm. long----------15. P. orbiculatum.
Blades as much as 10 cm. long; racemes over 3 cm. long.
16. P. arenarium.

Racemes numerous, at least more than 5.
Spikelets about 1.3 mm. long, subhemispheric, pubescent.
17. P. paniculatum.

Spikelets over 1.7 mm. long.
Spikelets glabrous.
Rachis scarcely pilose; spikelets 2 to 2.2 mm. long.
18. P. millegrana.
Rachis densely pilose; spikelet 1.8 to 2 mm. long.
19. P. densum.

Spikelets pubescent.
Spikelets obovate, 3 mm. long----------20. P. virgatum.
Spikelets 1.8 to 2.3 mm. long.
Spikelets elliptic, about 2.2 mm. long--21. P. coryphaeum.
Spikelets obovoid about 1.8 mm. long----22. P. abrahami.

1. Paspalum repens Bergius, Act. Helv. Phys. Math. **7**: 129. *pl.* 7. 1762.
Paspalum gracile Rudge, Pl. Guian. 20. *pl. 26*. 1805.
Paspalum fluitans Kunth, Rév. Gram. **1**: 24. 1829.

An aquatic or subaquatic perennial, with submerged stem and floating branches buoyed up by the inflated sheaths, with thin, flat blades and with panicles of numerous spreading racemes, the small, flat, elliptic, whitish spikelets in 2 rows on the broad green rachis.

RANGE: In sluggish streams or standing water, southeastern United States to Paraguay. Originally described from Dutch Guiana.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, in water of canal, *Hitchcock* 16526. Yarikita Police Station, floating in Yarikita River, *Hitchcock* 17647. Canje River, *Jenman* 1904. Lamaha, *Jenman* 3855*. Coast region, *Jenman* 4442, 6020. Barima River, *Jenman* 7109*. Without locality, *Schomburgk* 358.

2. Paspalum carinatum Humb. & Bonpl.; Flügge, Monogr. Pasp. 65. 1810.
Culms erect, 30 to 50 cm. tall, with numerous involute pilose blades 10 to 15 cm. long; raceme solitary, about 8 cm. long; spikelets appressed-silky.

RANGE: Savannas, Guiana to Brazil and Peru. Originally described from Peru.

SPECIMEN FROM BRITISH GUIANA: Wiruni-Ituni Savannas, County Berbice (Cattle-trail Survey), *Abraham* 83.

3. Paspalum pectinatum Nees; Trin. Gram. Icon. **1**: *pl. 117*. 1828.
An erect perennial, 30 to 60 cm. tall, with flat pilose blades and 2 conjugate racemes 3 to 6 cm. long; rachis broad and thin; spikelets about 5 mm. long, the sterile lemma pilose on the margin.

RANGE: Savannas, Costa Rica to southern Brazil, whence originally described.

SPECIMEN FROM BRITISH GUIANA: Mt. Roraima, "our house," *Im Thurn* 262.

4. Paspalum fimbriatum H. B. K. Nov. Gen. & Sp. **1**: 93. 1816.
An erect or ascending annual, 30 to 100 cm. tall, with ciliate sheaths, lax blades, and few to several ascending racemes, the imbricate spikelets with a broad, flat, lacerate, corky wing margin ciliate on the edge.

RANGE: Roadsides and waste places, West Indies and northern South America. Originally described from Colombia.

SPECIMENS FROM BRITISH GUIANA: Georgetown, grassy slope back of sea wall, *Hitchcock* 16836; *Kartright* in 1911.

5. Paspalum vaginatum Swartz, Prodr. Veg. Ind. Occ. 21. 1788.

Paspalum distichum var. *vaginatum* Swartz; Griseb. Fl. Brit. W. Ind. 541. 1864.

An extensively creeping perennial with loose sheaths and spreading involute-margined blades 2 to 6 mm. wide, tapering from base to apex, the sterile runners often stout with closely imbricate leaves, the flowering branches ascending, commonly 20 to 30 cm. tall, with a pair of divergent racemes (rarely 3) at the apex, the flat acuminate spikelets usually 3 to 4 mm. long.

RANGE: Sea coasts and brackish sands, Gulf Coast and the West Indies to South America. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Coast region, *Jenman* 4391, 4395, 4522.

6. Paspalum distichum L. Syst. Nat. ed. 10. **2**: 855. 1759.

Similar to *P. vaginatum*, but the flowering culms commonly taller and more slender and the blades slightly wider and softer; spikelets pubescent on the convex side.

The racemes are not reflexed and the sheaths are not inflated as is often the case in *P. vaginatum*.

RANGE: Ditches and wet (rarely brackish) places, southern United States and West Indies to South America; also in the Old World. The source of Linnaeus' specimen is unknown.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Kitty Village, mud along ditch, *Hitchcock* 16563. Lamaha Canal, *Jenman* 3962. Coast region, *Jenman* 4411*, 4520, 4523, 4586.

7. Paspalum conjugatum Bergius, Act. Helv. Phys. Math. **7**: 129. *pl. 8.* 1762.

SOURGRASS.

An extensively creeping perennial with compressed culms, the suberect flowering branches sometimes 1 meter tall; blades flat, rather thin, up to 20 cm. long, commonly about 8 mm. wide; racemes a pair (rarely a third below), widely divaricate, usually arcuate, slender, commonly 10 to 12 cm. long, the pale yellow flattened imbricate spikelets about 1.5 mm. long, with scant long silky hairs around the margin.

RANGE: Moist ground, Gulf States to Argentina; tropics and subtropics of both hemispheres; throughout the West Indies; one of the commonest grasses of moist savannas and ditch banks, forming extensively and close mats. Originally described from Dutch Guiana.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, grassland, *Hitchcock* 16613. Coast region, *Jenman* 3967, 6006*. Also *Meyer*, a fragment from a specimen in the Trinius Herbarium labeled "Fl. Esseq."

8. Paspalum multicaule Poir. in Lam. Encycl. Suppl. **4**: 309. 1816.

Paspalum papillosum Spreng. Nov. Prov. Hal. 47. 1819.

A low annual, profusely branching from the base and lower nodes, the sheaths and narrow linear blades pilose or nearly glabrous; racemes a pair at the summit of the culm (rarely solitary), divergent, slender, about 3 cm. long, the minute pale orbicular spikelets irregularly sprinkled with globular hairs, these often wanting on some of the spikelets but present on some on each plant.

RANGE: Moist savannas, especially in sandy soil, Cuba to Bolivia and Brazil, whence originally described.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, open moist sandy soil, *Hitchcock* 17081, 17104, 17105, 17137. Hills Estate near Bartica, a weed in field, *Hitchcock* 17187. Yawakuri-Ituni Savannas, County Berbice (Cattle-trail Survey), *Abraham* 98.

9. Paspalum serpentinum Hochst.; Steud. Syn. Pl. Glum. 1: 22. 1854.

Densely tufted, with gray-villous foliage and slender erect culms 50 to 60 cm. tall, the long erect stiff blades drying involute; racemes a slightly divergent pair, the spikelets solitary, nearly orbicular, about 2.5 mm. long, golden-brown, transversely marked with dark lines.

RANGE: Wet sandy savannas, Trinidad to Dutch Guiana, whence originally described.

SPECIMEN FROM BRITISH GUIANA: Rupununi Savanna, *Melville*.

10. Paspalum pumilum Nees, Agrost. Bras. 52. 1829.

Densely tufted, leafy at base, forming mats, the few slender culms ascending; sheaths and commonly the blades pubescent; racemes 2, approximate, arcuately divergent, the dull oval spikelets about 1.8 mm. long.

RANGE: Moist savannas, Leeward Islands to Uruguay. Originally described from Brazil.

SPECIMENS FROM BRITISH GUIANA: Southeast of Lama Stop-off, near canal, *Hitchcock* 16899, 16973, 17011 (pubescent specimens); 17012 (glabrous specimen). Penal Settlement, open ground in bushes, *Hitchcock* 17028. Bartica, grassland, *Hitchcock* 17260. Hills Estate, near Bartica, grassland, *Hitchcock* 17269. Wismar, sand hills, *Hitchcock* 17280. Akyma, wet grassland, *Hitchcock* 17433. Lama Dam, *Jenman* 6002*, 6015.

11. Paspalum pulchellum Kunth, Mém. Mus. Hist. Nat. Paris. 2: 68. 1815.

Perennial, in dense tufts, the slender simple culms 30 to 75 cm. tall, the pilose linear subinvolute blades clustered at the base, the culm sheaths bladeless or nearly so; racemes 2 or 3, approximate, spreading, 2 to 6 cm. long, the solitary glabrous oval spikelets about 1.8 mm. long; both glumes wanting, the sterile lemma tinged with red, sometimes dark crimson; fruit pale, smooth, and shining.

RANGE: Savannas, West Indies and northern South America. Originally described from Venezuela.

SPECIMENS FROM BRITISH GUIANA: Southeast of Lama Stop-off, sandy dike, *Hitchcock* 16974. Lama Stop-off, *Jenman* 4532. Lama Savanna, *Jenman* 6014.

12. Paspalum decumbens Swartz, Prodr. Veg. Ind. Occ. 22. 1788.

Paspalum pedunculatum Desv.; Poir. in Lam. Encyl. Suppl. 4: 315. 1816.

A freely branching decumbent perennial with slender compressed culms, velvety foliage, the flat blades 5 to 10 cm. long, 5 to 8 mm. wide, and solitary arcuate racemes usually 2 to 3 cm. long, borne on very slender peduncles, these commonly several from the upper sheaths; spikelets obovate, 1.5 mm. long, a small first glume present, the second glume about half the length of the fruit.

RANGE: Shaded banks and wooded slopes, Central America, the West Indies, and northern South America. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Hills Estate, near Bartica, open damp ground in partial shade, *Hitchcock* 17195. Wismar, sandy soil by ditch, *Hitchcock* 17278. Akyma, wet grassland, *Hitchcock* 17421. Mackenzie, wet grassland, *Hitchcock* 17465. Upper Demerara River, *Jenman* 4073.

13. Paspalum nutans Lam. Tabl. Encyl. 1: 175. 1791.

Resembling *Paspalum decumbens*, the culms longer, the foliage not velvety, the racemes sometimes 2 or 3, the spikelets 1.8 mm. long, the first glume wanting, the second nearly as long as the fruit.

RANGE: Shady banks and a weed in fields, Costa Rica and the Lesser Antilles to South America. Originally described from Central America.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, sandy soil along road in forest, *Hitchcock* 17034, 17083.

14. Paspalum melanospermum Desv.; Poir. in Lam. Encyl. Suppl. **4**: 315. 1816.

Paspalum olivaceum Hitch. & Chase, Contr. U. S. Nat. Herb. **18**: 310. 1917 .

A smooth spreading annual, the culms ascending or erect from a decumbent base, 30 to 60 cm. tall, with lax flat blades, and 4 to 6 arcuate ascending racemes 1.5 to 3 cm. long scattered along an axis 3 to 5 cm. long; rachis about 1 mm. wide; spikelets glabrous, 2 mm. long, more or less wrinkled on the flat side.

RANGE: Open moist sandy soil, Guadeloupe to Brazil. Originally described from Cayenne.

SPECIMENS FROM BRITISH GUIANA: Parika, sand near sea, *Hitchcock* 16812. Penal Settlement, open sandy ground, *Hitchcock* 17064, 17102. Kyk-over-al Island, open ground, *Hitchcock* 17198. Wismar, sandhills, *Hitchcock* 17279. Tumatumari, open clay ground, *Hitchcock* 17339; *Gleason* 24. Rockstone, *Gleason* 635. Akyma, grassland, *Hitchcock* 17427, 17438. Morawhanna, weed in garden, *Hitchcock* 17470. Essequibo River, *Jenman* 994*, 1093*. Coast region, *Jenman* 1509*, 1518*. Lamaha, *Jenman* 3862. Lama, *Jenman* 6004. Without locality, *Jenman* 6003.

In the account of the Grasses of the West Indies [11] the name *P. melanospermum* was applied to a different species having solitary spikelets on a wider rachis. Subsequent collections from British Guiana show that the form described as *P. olivaceum* is an annual and that it is common there; therefore it is very probable that it is *P. melanospermum*, which was described from Cayenne, though the description is inadequate.

15. Paspalum orbiculatum Poir. in Lam. Encyl. **5**: 32. 1804.

Paspalum pusillum Vent.; Flügge, Monogr. Pasp. 100. 1810.

A glabrous creeping perennial with ascending flowering branches 10 to 20 cm. tall, the delicate culms finally branching; blades flat, spreading, mostly 1.5 to 4 cm. long, 4 to 7 mm. wide; racemes 2 or 3, short-exserted, 4 to 5 mm. distant, 1 to 2 cm. long, the minute, glabrous, pale yellow, suborbicular spikelets singly disposed.

RANGE: Wet places, southern Mexico and the West Indies to Brazil. Originally described from Porto Rico.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, partly in shallow water, along ditch, *Hitchcock* 16620. Tumatumari, open clay ground, *Hitchcock* 17341. Coast lands, *Jenman* 6005. Barima River, *Jenman* 7101*.

15a. Paspalum orbiculatum potarense Chase, subsp. nov.

Differs from *P. orbiculatum* in the larger, oval or ovate instead of orbicular spikelets, 1.2 to 1.3 mm. long, the apex subacute, the midnerve (always suppressed in the species) often developed.

Type in the U. S. National Herbarium, no. 1,039,241, collected at Amatuk Falls, Potaro River, British Guiana, October, 1898, by G. S. Jenman (no. 7481).

Known only from the type specimen. This consists of several plants with the habit of *P. orbiculatum*. Most of the blades are narrower than usual in the species, though occasional specimens of the species have blades quite as narrow. In all the racemes of the type specimen the spikelets are longer and subacute, but the midnerve is developed in less than one-fourth of them and usually not throughout the raceme.

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[11] Contr. U. S. Nat. Herb. **18**: 311. 1917.

16. Paspalum arenarium Schrad. in Schult. Mant. 2: 172. 1824.

A spreading, often prostrate perennial, the slender culms ascending, 30 to 60 cm. long, with flat pilose blades as much as 12 mm. wide; racemes slender, arcuate, 3 to 6 cm. long, usually 2 on the main culm, one 10 to 15 cm. below the other, usually only 1 on the slender axillary branches; spikelets obovoid, 1.3 mm. long, nearly as wide, slightly pubescent on the convex side.

RANGE: Sandy soil, Guiana to Brazil, whence originally described.

SPECIMENS FROM BRITISH GUIANA: Head of Horeabea Creek, sandy savanna, *Hitchcock* 16934, 16957. Penal Settlement, sandy moist soil by road in forest, *Hitchcock* 17082, 17087. Wismar, sand hills, *Hitchcock* 17282. Demerara River, *Jenman* 4585*. Rockstone, *Gleason* 634.

17. Paspalum paniculatum L. Syst. Nat. ed. 10. 2: 855. 1759.

A weedy branching perennial, commonly a meter or more tall, the foliage harshly pubescent, the flat blades 20 to 30 cm. long, about 1.5 cm. wide; racemes very numerous, slender, crowded in an oblong panicle, the minute crowded subhemispheric spikelets pubescent.

Exceedingly variable in size and in the amount of pubescence.

RANGE: Savannas, open or partly shaded, mostly moist ground, Mexico and the West Indies to Brazil. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Hills Estate, near Bartica, weed in old field, *Hitchcock* 17190. Mackenzie, moist grassland, *Hitchcock* 17460. Demerara River, *Jenman* 4587*. Lama, *Jenman* 5966*.

18. Paspalum millegrana Schrad. in Schult. Mant. 2: 175. 1824.

In large strong-rooted clumps, commonly 1.5 meters tall; lower sheaths nodulose, much overlapping; blades partially conduplicate, narrower, stiffer, and more scabrous than those of *P. virgatum*, often finely pubescent on the upper surface; racemes usually numerous, rather aggregate, ascending, the glabrous paired crowded spikelets usually glaucous-purplish or lead color, 2 to 2.2 mm. long, obovate-suborbicular, sometimes almost obcordate and apiculate.

RANGE: Open, mostly moist ground, Bahamas and the Greater Antilles to southern Brazil. Originally described from Brazil.

SPECIMENS FROM BRITISH GUIANA: Mahaica, along coast, *Hitchcock* 16781. New Amsterdam, along ditch, *Hitchcock* 16819. Morawhanna, along water front, *Hitchcock* 17477.

19. Paspalum densum Poir. in Lam. Encycl. 5: 32. 1804.

Like *Paspalum millegrana* in habit, the culms and sheaths more lush and in drying more strongly nodulose; racemes 4 to 6 cm. long, very numerous, aggregate in an elongate-pyramidal panicle, the rachises conspicuously pilose, the light brown, glabrous, densely crowded spikelets 1.8 to 2 mm. long, nearly as broad.

RANGE: Wet savannas and open wet ground, West Indies and Panama to Guiana. Originally described from Porto Rico.

SPECIMENS FROM BRITISH GUIANA: Parika, wet savanna, *Hitchcock* 16816. Lamaha, banks, *Jenman* 3656, 5967*.

20. Paspalum virgatum L. Syst. Nat. ed. 10. 2: 855. 1759.

A robust perennial growing in large clumps, the erect culms commonly 2 meters tall, the lower sheaths nodulose in drying; blades commonly 50 cm. long or more, 1 to 2 cm. wide, flat, the margins very scabrous; racemes several to many, 5 to 12 cm. long, forming a panicle 20 to 40 cm. long; spikelets in pairs, crowded, grayish, becoming rusty brown at maturity, obovate, 3 mm. long, 2 mm. wide, silky-hairy around the margin.

RANGE: Banks and slopes, mostly moist and swampy ground, Mexico and the West Indies to Argentina. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, along canal. *Hitchcock* 16552. Tumatumari, open moist ground, *Hitchcock* 17336; *Gleason* 34. Lamaha Dam, *Jenman* 3660. Coast lands, *Jenman* 4437, 6199. Rockstone, *Gleason* 649.

21. Paspalum coryphaeum Trin. Gram. Pan. 114. 1826.

I have tentatively referred to this species the specimens mentioned below. A sandy, elevated area along the Mazaruni River below the Penal Settlement, a clearing in the forest giving a fine view of the river, was almost exclusively occupied by this species. The grass had been mowed and no fertile culms were seen, except a single specimen on the bank just below the main area. Long runners are formed, a meter or more in length. Culms erect, about 1 meter tall, pubescent at the nodes; blades erect, as much as 1 cm. wide, villous or the lower surface glabrescent; racemes 8, 6 to 10 cm. long, arcuate, ascending or appressed; spikelets elliptic, about 2.2 mm. long, pubescent.

RANGE: Savannas, Trinidad to Brazil, whence originally described.

SPECIMEN FROM BRITISH GUIANA: Penal Settlement, open ground on hill by river, *Hitchcock* 17238. "Within 30 miles of Georgetown," *Rodway* 32, the specimen in the City Museum of Georgetown.

22. Paspalum abrahami Chase, sp. nov. FIG. 81.

Plants perennial from stout scaly rhizomes, the scales densely pubescent; culms 1 meter tall or more, erect, simple, glabrous; nodes appressed-pubescent; sheaths much overlapping (the lower bladeless), strongly nerved, keeled toward the summit, the keel for about 4 or 5 mm. at the summit densely pilose, sparsely ciliate on the brown hyaline margin, otherwise glabrous, or the lowermost sparsely pubescent, the junction with the blade drying black; ligule brown, membranaceous, lacerate, 2 to 2.5 mm. long; blades erect at the folded base, flat above, some of them 50 cm. long or more, 12 to 14 mm. wide, tapering into a long, twisted, smooth tip, the base scarcely wider than the summit of the sheath, long-ciliate on the margin toward the base and sparsely pilose on the upper surface, glabrous beneath; racemes (in the only plant seen) 6, narrowly ascending, 4 to 10 cm. long, the common axis slender, angled, and with long, erect, white hairs at base and in the axils of the racemes; rachis slender, flexuous, glabrous; spikelets in pairs, on minutely hairy pedicels, crowded, light brown, strongly plano-convex, obovate, 2 mm. long, 1.2 mm. wide; glume and sterile lemma equal, barely covering the fruit, fragile, pilose with white spreading hairs arising from dark bases, the lemma sparsely so, its midnerve suppressed; fruit light brown, smooth, and shining.

Type in the U. S. National Herbarium no. 1,039,242, collected in Yawakuri Savannah, Berbice County, British Guiana, October 6, 1919, by A. A. Abraham (no. 173).

Known only from the type collection. This tall species is not closely related to any thus far described. It is distinguished by its rhizomes, its elongate blades, and by the little hairy mane of the keel at the summit of the sheath.

35. PANICUM L.

Inflorescence paniculate (rarely racemose); spikelets pedicellate, biconvex; first glume present; sterile lemma usually inclosing a hyaline palea, sometimes a staminate flower; fruit chartaceous-indurate, the margins of the lemma inrolled.

Fruit transversely rugose.

Plants annual.

Spikelets glabrous ..... 1. P. reptans.

Spikelets pubescent ..... 2. P. molle.

FIG. 81.—*Paspalum abrahami.* From the type specimen.

Plants perennial.
Spikelets in a large open panicle----3. P. maximum.
Spikelets subsessile along the main branches of the panicle.
Nodes bearded; inflorescence of numerous long subfasciculate ascending racemes----4. P. barbinode.
Nodes glabrous; inflorescence of several short erect racemes.
5. P. geminatum.
Fruit not transversely rugose.
Plants annual. (See also nos. 29 and 31)----6. P. trichoides.
Plants perennial.
Spikelets short-pediceled along one side of the panicle branches, forming more or less spikelike racemes. (See also no. 18.)
Blades lanceloate or ovate-lanceolate.
Blades not over 5 cm., usually 2 to 3 cm. long; second glume rather blunt and shorter than the sterile lemma----7. P. stoloniferum.
Blades 5 to 15 cm. long; second glume acute, nearly equaling the sterile lemma----8. P. frondescens.
Blades linear, often elongate.
Spikelets pubescent----9. P. luticola.
Spikelets glabrous.
Lower branches of panicle longer than the upper, bearing secondary branches; spikelets loosely arranged.
Nodes glabrous----10. P. laxum.
Nodes villous----12. P. polygonatum.
Lower branches scarcely longer than any except the uppermost, simple, the rachises usually pilose; spikelets closely arranged.
Culms as much as 1 or 2 meters long; panicles 25 to 30 cm. long.
13. P. millefiorum.
Culms not over 1 meter long; panicles mostly 5 to 15 cm. long.
14. P. pilosum.
Spikelets in open or contracted panicles, but not in 1-sided spikelike racemes.
Spikelets pubescent.
Spikelets 4 mm. long.
Blades cordate-clasping; first glume as long as the spikelet, obtuse.
15. P. asperifolium.
Blades not clasping at base; first glume acute, shorter than the spikelet----16. P. magnum.
Spikelets not over 2 mm. long.
Pedicels much longer than the spikelets; blades rounded or truncate at base, not clasping----17. P. millegrana.
Pedicels, some of them, shorter than the spikelets; blades cordate-clasping----11. P. guianense.
Spikelets glabrous.
Fertile lemma crested at apex. Spikelets 5 mm. long, appressed along the main branches of the panicle----18. P. zizanioides.
Fertile lemma not crested.
Panicles narrow, few-flowered, mostly less than 2 cm. long; spikelets scarcely 1.5 mm. long----19. P. stenodes.
Panicles several to many-flowered, open or diffuse, often large.
Plants succulent. Spikelets acuminate, the first glume about one-fourth as long as the spikelets; large water grasses.
20. P. elephantipes.

A spreading annual with culms mostly 20 to 30 cm. long, lanceolate blades as much as 5 cm. long and 1 cm. wide, several ascending racemes as much as 2 cm. long, and glabrous spikelets 2 mm. long.

RANGE: Open ground, at low altitudes, especially near the coast, frequently a weed in waste places and cultivated soil, Gulf Coast of the United States and Atlantic slope of Mexico, throughout the West Indies to northern South America; also introduced in the warm regions of the Eastern Hemisphere. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, weed in flower beds, *Hitchcock* 16605. Without locality, *Jenman* 6024.

2. Panicum molle Swartz, Prodr. Veg. Ind. Occ. 22. 1788.

Panicum velutinosum Nees, Agrost. Bras. 121. 1829.

A spreading annual as much as 1 meter tall, with pubescent nodes, blades as much as 15 mm. wide, several ascending racemes as much as 3 cm. long, and pubescent pointed spikelets about 3.5 mm. long, with cross veins between the nerves.

RANGE: Open ground, often a weed in fields, Cuba, Jamaica, Mexico, and Central America to Argentina. Originally described from the West Indies.

SPECIMEN FROM BRITISH GUIANA: Without locality, *Schomburgk* 684.

3. Panicum maximum Jacq. Coll. Bot. 1: 76. 1786. GUINEA GRASS.

Panicum polygamum Swartz, Prodr. Veg. Ind. Occ. 24. 1788.

Panicum jumentorum Pers. Syn. Pl. 1: 83. 1805.

A tufted erect perennial as much as 2 meters tall, sometimes taller, with pubescent nodes and a large open panicle of green oblong glabrous spikelets 3 mm. long.

RANGE: A native of tropical Africa, commonly cultivated in the American tropics at low altitudes, often escaped and spontaneous, but infrequent in British Guiana.

SPECIMEN FROM BRITISH GUIANA: Near Bartica, spontaneous on Hills Estate, *Hitchcock* 17176.

4. Panicum barbinode Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 1: 256. 1834. PARÁ GRASS.

A tall perennial with long branching decumbent bases, pubescent nodes, glabrous blades, several racemes on an axis 15 to 20 cm. long, the lower as much as 5 to 10 cm. long and more or less branching, and glabrous spikelets 3 mm. long.

RANGE: Cultivated and waste grounds at low altitudes, especially in moist places, tropical America, where it appears to be introduced, probably from Africa. Originally described from Brazil.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Peters Hall, moist ground back of sea dike, *Hitchcock* 16670. Akyma, wet clearing among bushes, *Hitchcock* 17439. Pomeroon River, *Bartlett* 8011. Coast lands, *Jenman* 1517*, 4541*, 5997, 5998.

5. Panicum geminatum Forsk. Fl. Aegypt. Arab. 18. 1775.

Paspalum appressum Lam. Tabl. Encyl. 1: 176. 1791.

A glabrous tufted perennial with numerous culms usually 25 to 80 cm. tall, narrow panicles 12 to 30 cm. long, with appressed racemes 1 to 3 cm. long, and glabrous spikelets a little over 2 mm. long.

RANGE: Moist ground or in shallow water, mostly near the coast, southern Florida and Texas to Brazil and Peru; also in the warmer parts of the Old World. Originally described from Egypt.

Plants not succulent.
Spikelets about 6 mm. long, acuminate; panicle branches elongate, naked below——21. P. olyroides.
Spikelets less than 4 mm. long.
Panicles large, 40 to 60 cm. long, the numerous elongate branches in verticils. Spikelets 3.5 mm. long, globular-ovoid——22. P. megiston.
Panicles usually much less than 40 cm. long, the branches not in verticils.
Blades in a basal cluster, firm, erect, about 30 cm. long.
Spikelets 2 mm. long; blades appressed-villous. 23. P. chnoodes.
Spikelets 3 mm. long; blades glabrous——24. P. eligulatum.
Blades not in a long basal cluster.
Culms robust, rather woody, branching. Spikelets more than 3 mm. long, abruptly pointed.
Sheaths densely hispid——25. P. rudgei.
Sheaths glabrous——26. P. altum.
Culms not robust and branching.
Spikelets viscid, obtuse, 3 mm. long. Blades 15 to 25 mm. wide, lax——27. P. glutinosum.
Spikelets not viscid, less than 2.5 mm. long.
Spikelets acute, about 2 mm. long.
Panicle loosely flowered; pedicels long and flexuous——28. P. pilcomayense.
Panicle densely flowered; pedicels short, some of them shorter than the spikelets. 29. P. hirsutum.
Spikelets subglobose; panicles mostly less than 10 cm. long.
Spikelets not over 1 mm. long; culms filiform.
Blades pilose——30. P. micranthum.
Blades glabrous——31. P. polycomum.
Spikelets 1.5 to 2 mm. long; culms not filiform.
Spikelets 2 mm. long. Plants decumbent, spreading——32. P. errabundum.
Spikelets about 1.5 mm. long.
Culms very slender, decumbent or creeping; blades 1 to 3 cm. long——33. P. parvifolium.
Culms firm, erect, or decumbent at the base only; blades mostly more than 3 cm. long.
Blades mostly not over 7 mm. wide. 34. P. cyanescens.
Blades as much as 15 mm. wide and 15 cm. long, the lower sheaths much overlapping, the base of the blade conspicuously clasping——35. P. nervosum.

1. **Panicum reptans** L. Syst. Nat. ed. 10. 2: 870. 1759.
Panicum grossarium L. Syst. Nat. ed. 10. 2: 871. 1759.
Panicum prostratum Lam. Tabl. Encycl. 1: 171. 1791.
Panicum caespitosum Swartz, Fl. Ind. Occ. 1: 146. 1797.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, mud or shallow water along canal, *Hitchcock* 16528. Lamaha, *Jenman* 3969. Coast region, *Jenman* 4372, 4438, 6021, 6022.

This species has been incorrectly referred to *Panicum paspalodes* Pers.

6. Panicum trichoides Swartz, Prodr. Veg. Ind. Occ. 24. 1788.

A branching annual 20 to 40 cm. tall, with thin lanceolate acuminate blades 1 to 2 cm. wide, delicate open panicles 5 to 20 cm. long, and long-pediceled, sparsely hirsute spikelets a little over 1 mm. long.

RANGE: Woods and open ground, often a weed in cultivated soil, Mexico and the West Indies to Brazil and Ecuador. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Promenade Gardens, *Hitchcock* 16598. Akyma, wet grassland, *Hitchcock* 17431. Issorora, a weed in clearing on hill, *Hitchcock* 17547. Aruka River, *Bartlett* 8577. Demerara, coast region, *Jenman* 4403. Tumatumari, *Gleason* 322.

This species has been incorrectly referred to *Panicum brevifolium* L.

7. Panicum stoloniferum Poir. in Lam. Encycl. Suppl. 4: 274. 1816.

A creeping, freely branching perennial, with fertile branches 10 to 30 cm. tall, lanceolate blades 3 to 15 mm. wide, panicles 1 to 5 cm. long, several spreading racemes 5 to 10 mm. long, and glabrous spikelets 2.5 mm. long.

RANGE: Woods and low ground, Guatemala to Brazil and Ecuador. Originally described from Cayenne.

SPECIMENS FROM BRITISH GUIANA: Rockstone, wet place near river, *Hitchcock* 17314. Portage between Aruau and Yarikita rivers, open ground in shade along trail, *Hitchcock* 17590. Pomeroon River, *Jenman* 1999*. Mt. Russell District, *Jenman* 2106*. Upper Demerara River, *Jenman* 4081. Barima River, *Jenman* 7079*. Tumatumari, *Gleason* 290.

8. Panicum frondescens Meyer, Prim. Fl. Esseq. 56. 1818.

Culms ascending from a decumbent or creeping base, 30 to 50 cm. tall, the lanceolate blades 12 to 30 mm. wide; racemes numerous and crowded, the lower as much as 25 mm. long; spikelets glabrous, 2.5 to 2.8 mm. long.

RANGE: Moist ground, Mexico to Brazil and Peru. Originally described from "Arouabisch" Island, British Guiana.

SPECIMENS FROM BRITISH GUIANA: Potaro, new ground from gold dredge, *Hitchcock* 17410. Akyma, wet place near river, *Hitchcock* 17446. Mackenzie, wet ground near river, among bushes, *Hitchcock* 17461. Morawhanna, back of mangroves, *Hitchcock* 17493. Issorora, wet forest, *Hitchcock* 17568, 17588. Barima River, *Jenman* 7115.

9. Panicum luticola Hitchc., sp. nov. FIG. 82.

Plants perennial; culms erect, or decumbent at base, glabrous, 40 to 60 cm. tall; sheaths glabrous, shorter than the internodes, ciliate on the margin; ligule a very short ciliate membrane; blades ascending or appressed, 5 to 12 cm. long, 4 to 7 mm. wide, rounded or truncate at base or the upper somewhat cordate, glabrous beneath, minutely scabrous above and on the margin; panicle contracted, 8 to 15 cm. long, the branches appressed, the lower 2 or 3 distant; spikelets about 1.3 mm. long, rather blunt, minutely pubescent, nearly sessile, rather loosely and irregularly arranged along one side of the axis of the main branches; first glume about half as long as the spikelet; second glume and sterile lemma about equal, slightly exceeding the fruit, the lemma with a well-developed palea; fertile lemma elliptic, acute.

Type in the U. S. National Herbarium, no. 1,038,962, collected on a tidal flat along the Mazaruni River at the Penal Settlement, British Guiana, December 5, 1920, by A. S. Hitchcock (no. 17113).

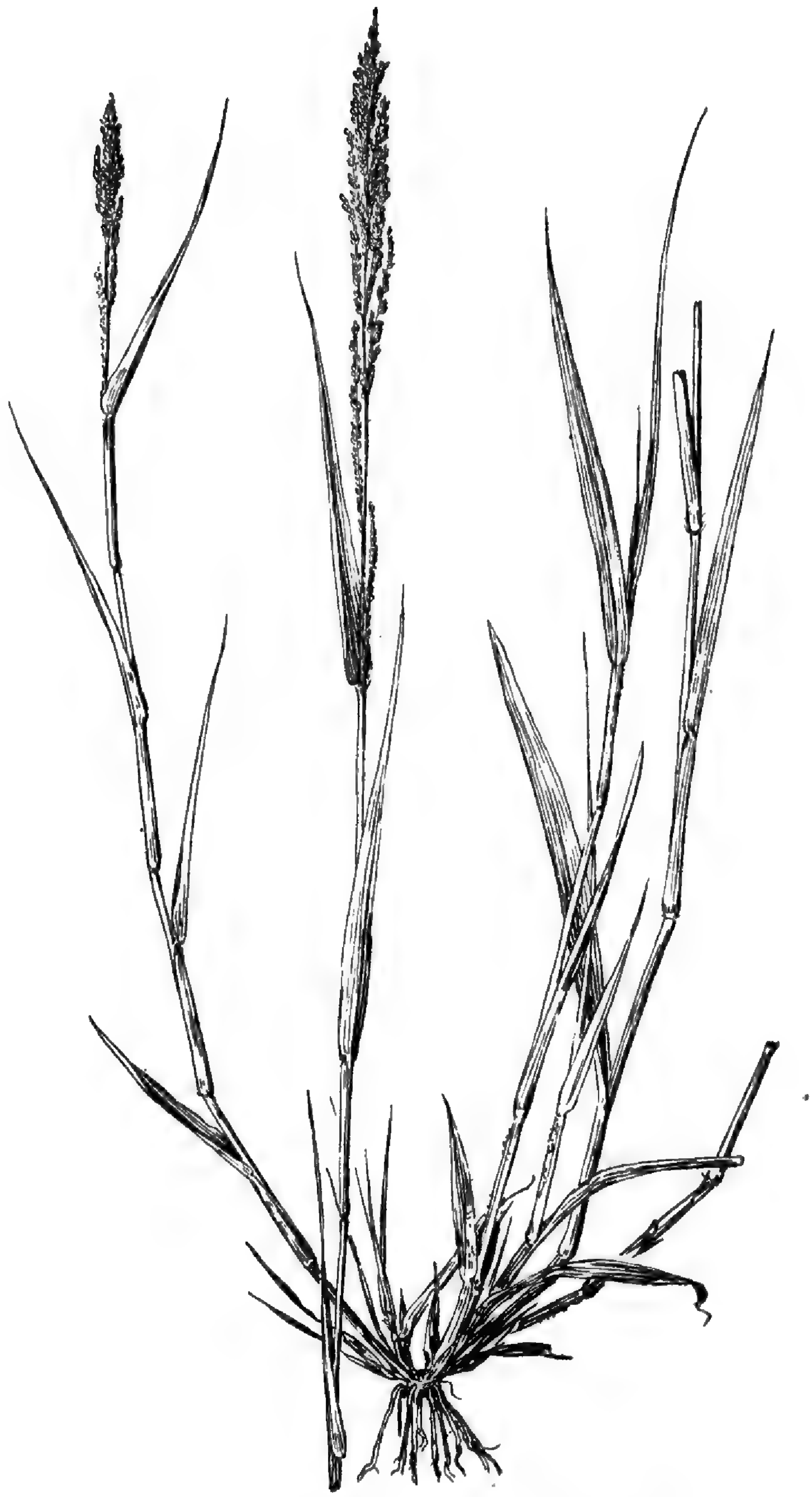

Fig. 82.—*Panicum lutticola.* From the type specimen.

This species is allied to *Panicum laxum*, from which it differs in the pubescent spikelets and the contracted panicle. At the type locality the plants were nearly or quite covered at high tide and fully exposed at low tide. The water here is fresh or nearly so. This is probably the same as *P. laxum* var. *pubescens* Doell.[12]

10. Panicum laxum Swartz, Prodr. Veg. Ind. Occ. 23. 1788.

Panicum tenuiculme Meyer, Prim. Fl. Esseq. 58. 1818.

Plants more or less spreading or decumbent at base, usually 40 to 60 cm. tall, sometimes taller; panicle open, the spikelets along one side of the spreading main branches; spikelets a little more than 1 mm. long.

RANGE: Ditches and moist open ground, common, Mexico and the West Indies to Paraguay. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, along ditches, *Hitchcock* 16615. East Coast Water Conservancy, along ditch, *Hitchcock* 17024. Tumatumari, open clay ground, *Hitchcock* 17340. Akyma, wet grassland, *Hitchcock* 17424. Morawhanna, wet places, *Hitchcock* 17475. Pomeroon River, *Bartlett* 8009. Essequibo River, *Jenman* 995*, 1132*. Coast region, *Jenman* 4431, 4526, 6007. Lama Savanna, *Jenman* 6008, 6009.

11. Panicum guianense Hitchc., sp. nov. FIG. 83.

Plants perennial; culms slender, erect from a more or less decumbent base, glabrous, 1 to 2 meters tall; sheaths much shorter than the internodes, glabrous, pilose on the collar; ligule a very short ciliate membrane; blades spreading, flat, narrowly lanceolate or oblong-lanceolate, 10 to 15 cm. long, about 1.5 cm. wide, acuminate at apex, cordate-clasping and ciliate at base, glabrous on both surfaces, scabrous on the margin; panicle loose and open, as much as 30 cm. long, the axis glabrous below, scabrous above, the main branches distant, as much as 15 cm. long, the lower single but with short branchlets near the base, the axils slightly pilose, the branchlets short, somewhat appressed; spikelets oval, minutely pubescent, about 1.3 mm. long, short-pediceled and appressed along the branchlets, the pedicels mostly shorter than the spikelet; first glume ovate, nearly half as long as the spikelet; second glume a little shorter than the fertile lemma, this and the sterile lemma about equal; palea of sterile floret well developed; fertile lemma elliptic, acute.

Type in the U. S. National Herbarium, no. 1,038,517, collected along river bank, in or near the water, Rockstone, British Guiana, January 1, 1920, by A. S. Hitchcock (no. 17313).

No specimens except the type collection have been seen.

The species belongs to the *Laxa* group and is most closely allied to *P. boliviense* Hack., from which it differs in the pubescent spikelets and the much taller and more slender culms and larger panicles.

12. Panicum polygonatum Schrad. in Schult. Mant. 2: 256. 1824.

Similar to *P. laxum;* nodes pubescent; blades more or less cordate at base; panicle more branching, the main branches mostly rebranched, the axis with occasional long hairs.

RANGE: Swamps and moist ground, Mexico to Brazil and Paraguay. Originally described from Brazil.

SPECIMENS FROM BRITISH GUIANA: Issorora, wet places near river, *Hitchcock* 17589; *Stockdale* in 1912.

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[12] Mart. Fl. Bras. 2[3]: 213. 1877.

FIG. 83.—*Panicum guianense.* From the type specimen.

13. Panicum milleflorum Hitchc. & Chase, Contr. U. S. Nat. Herb. **17**: 494. *f. 70.* 1915.

Resembling *P. pilosum* but larger, the culms as much as 1.5 meters long, creeping and rooting at base; panicle 20 to 35 cm. long.

RANGE: Swamps and wet places, Panama, whence originally described, to Guiana.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, among bushes in swamp, *Hitchcock* 17172. Rockstone, wet land, *Hitchcock* 17315, 17322. Potaro, new land from gold dredge, *Hitchcock* 17407. Akyma, wet ground near river, *Hitchcock* 17447. Mackenzie, wet ground near river, *Hitchcock* 17463. Issorora, wet field, *Hitchcock* 17585.

14. Panicum pilosum Swartz, Prodr. Veg. Ind. Occ. 22. 1788.

Panicum pilisparsum Meyer, Prim. Fl. Esseq. 57. 1818.

Spreading or ascending, as in *P. laxum;* panicles 5 to 15 cm. long, the numerous dense racemes 1 to 3 cm. long, rather closely arranged along the main axis, the rachises stiffly ciliate; spikelets glabrous, 1.5 mm. long.

RANGE: Moist ground and open woods, Mexico and the West Indies to Brazil. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Peters Hall, low ground along ditch, *Hitchcock* 16671. Parika, savanna, *Hitchcock* 16800. Tumatumari, *Hitchcock* 17338; *Gleason* 930. Akyma, wet grassland, *Hitchcock* 17435. Morawhanna, a weed in field, *Hitchcock* 17483. Short Cut Waini River, *Becket* 8508. Coast region, *Jenman* 1513*. Upper Demerara River, *Jenman* 4024. Lama Creek, *Jenman* 5968. Macaseema, Poomeroon River, *Jenman* 7794. Without locality, *Jenman,* 5969; *Schomburgk* 481, 1224. Rockstone, *Gleason* 621.

15. Panicum asperifolium (Desv.) Hitchc.

Streptostachis asperifolia Desv. Nouv. Bull. Sci. Philom. Paris **2**: 190. 1810.

Streptostachys hirsuta Beauv. Ess. Agrost. 50. *pl. 10. f. 11.* 1812.

Panicum streptostachys Spreng. Syst. Veg. **1**: 316. 1825.

Panicum balanites Trin. Linnaea **10**: 297. 1836.

Plants about 1 meter tall from a decumbent base; sheaths glabrous or hirsute; blades thin, as much as 20 cm. long and 3.5 cm. wide, cordate-clasping; panicle of a few distant spreading branches, the spikelets and branchlets appressed; spikelets 4 mm. long, oblong, obtuse, pubescent, the base hardened and ring-like; first glume as long as the spikelet.

RANGE: Forests, Guiana to Brazil. Described from tropical America.

SPECIMEN FROM BRITISH GUIANA: Without locality, *Schomburgk* 774.

FIG. 84.

16. Panicum magnum Hitchc., sp. nov.

Plants perennial, somewhat glaucous, forming large colonies with decumbent bases; culms as much as 5 meters tall and 1.5 cm. thick at base, glabrous; sheaths glabrous, pilose in a line on the collar, the angles at the summit extending upward as an auricle or appendage; ligule a short brown membrane about 1 mm. long; blades narrowly elliptic, as much as 25 cm. long and 3 cm. wide, acuminate at apex, rounded at the narrowed base, scabrous on the upper surface and paler beneath; panicle ellipsoid, as much as 30 cm. long and 10 cm. wide, the branches ascending, the middle ones about 7 cm. long, puberulent and pilose at base, the spikelets and short branchlets ascending along the main branches, somewhat 1-sided; spikelets about 4 mm. long, minutely scaberulous-pubescent or roughened, the pedicels scaberulous; first glume rather more than half as long as the spikelet, the thin, tawny margin often sparsely beset with long hairs (these sometimes as much as 5 mm. long), several-nerved, the principal nerves 5; second glume and sterile lemma equal, several-nerved, the

FIG. 84.—*Panicum magnum.* From the type specimen.

apex slightly incurved, that of the sterile lemma often sparsely villous; sterile floret staminate, the palea well developed; fertile lemma a little shorter than the spikelet, elliptic, acute.

Type in the U. S. National Herbarium, no. 1,038,505, collected in rich soil along edge of forest, about 3 miles southwest of Bartica, British Guiana, December 10, 1919, by A. S. Hitchcock (no. 17194).

The plant has the aspect of a species of *Lasiacis*, but the culms are not woody, the spikelets are not strongly oblique on the pedicels, and the fruit is not shaped as in that genus. Unsupported stems may be as much as 5 meters long, while clambering culms may reach as high as 10 meters.

RANGE: Lowland forest, British Guiana.

SPECIMENS FROM BRITISH GUIANA: Hills Estate near Bartica, edge of forest, *Hitchcock* 17194. Bartica, along road through virgin forest, *Hitchcock* 17250; *Jenman* 2510, 2461*. Mt. Russell District, *Jenman* 2088*. Mazaruni River, *Jenman* 7620.

17. Panicum millegrana Poir. in Lam. Encycl. Suppl. **4**: 278. 1816.

Panicum rugulosum Trin. Gram. Pan. 195. 1826.

Plants perennial, spreading; culms as much as 1 meter tall; blades thin, as much as 15 cm. long and 3 cm. wide, pubescent or glabrate; panicle loose and open, rather few-flowered; spikelets a little over 2 mm. long, glabrous or (in our specimen) pubescent.

RANGE: Damp woods, Cuba and Mexico to Brazil. Originally described from Cayenne.

SPECIMEN FROM BRITISH GUIANA: Courantyne River, Orealla, *Jenman* 197.

18. Panicum zizanioides H. B. K. Nov. Gen. & Sp. **1**: 100. 1816.

Panicum oryzoides Swartz, Prodr. Veg. Ind. Occ. 23. 1788. Not *P. oryzoides* Ard. 1764.

Acroceras oryzoides Stapf in Prain, Fl. Trop. Afr. **9**: 622. 1920.

Plants branched, decumbent and rooting at base, forming a tangle; fertile culms 30 to 60 cm. tall, sometimes taller; blades cordate-clasping, 5 to 15 cm. long, usually 1 to 2 cm. wide; panicle of a few ascending distant branches, the spikelets and short branchlets appressed along these; spikelets 5.5 to 6 mm. long, glabrous, pointed, the first glume nearly as long as the spikelet; fertile lemma with a little appendage or crest at the apex.

RANGE: Moist places, tropical regions of both hemispheres. Originally described from Colombia.

SPECIMENS FROM BRITISH GUIANA: Parika, boggy place, *Hitchcock* 16758. Kyk-over-al Island, back of beach, *Hitchcock* 17199. Tumatumari, near river, *Hitchcock* 17343; *Gleason* 32. County Berbice (Cattle-trail Survey), banks of Yawakuri River, *Abraham* 196. Coast region, *Jenman* 1510*. Kalacoon, *Jenman* 3610. Lamaha, *Jenman* 3857*. Lamaha Dam, *Jenman* 6001. Rupununi Savanna, *Melville*. Without locality, *Schomburgk* 539, 768. Rockstone, *Gleason* 639.

19. Panicum stenodes Griseb. Fl. Brit. W. Ind. 547. 1864.

Plants perennial, tufted, the culms erect, stiff and wiry, 25 to 50 cm. tall, the narrow blades appressed; panicle narrow and few-flowered, 1 to 2 cm. long; spikelets about 1.5 mm. long, glabrous.

RANGE: Borders of ponds and in wet savannas, West Indies and Costa Rica to Brazil. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Lama Stop-off, sandy soil on dike, *Hitchcock* 16900; *Jenman* 4534. Lama Dam, *Jenman* 6025.

20. Panicum elephantipes Nees, Agrost. Bras. 165. 1829.

Plants perennial, with long decumbent or creeping rooting base; culms succulent, as much as 2 cm. thick, 1 to 2 meters tall or more, the nodes black in drying; panicle large and open; spikelets narrow, acute, 4 to 5 mm. long, the first glume less than half as long.

RANGE: Ponds and shallow water, sometimes forming floating islands, West Indies and southern Mexico to Argentina. Originally described from Brazil.

SPECIMENS FROM BRITISH GUIANA: Morawhanna, along river, *Hitchcock* 17469. Above Issorora, in water of river, *Hitchcock* 17659½. Pomeroon River, *Jenman* 1618*. Demerara River, *Jenman* 5977*. Berbice, *Jenman* 6463. Barima River, *Jenman* 7064. Rockstone, *Gleason* 891.

21. Panicum olyroides H. B. K. Nov. Gen. & Sp. 1: 102. 1816.

Plants perennial, erect, 50 to 100 cm. tall, the sheaths overlapping, the blades firm; panicle large and open, 20 to 30 cm. long, the numerous stiff branches slender and naked below; spikelets rather few and large, on slender pedicels, disposed toward the ends of the branches, fusiform, acuminate, 6 to 7 mm. long.

RANGE: Savannas, Venezuela to Brazil. Originally described from Venezuela.

SPECIMEN FROM BRITISH GUIANA: Yawakuri Savanna, County Berbice (Cattle-trail Survey), *Abraham* 177.

22. Panicum megiston Schult. Mant. 2: 248. 1824.

Panicum altissimum Meyer, Prim. Fl. Esseq. 63. 1818. Not *P. altissimum* DC. 1817.

A tall robust perennial with long creeping base, the flowering culms 1 to 2 meters tall; panicle 40 to 60 cm. long, open, the stiff main branches in distant verticils; spikelets globular-ovoid, about 3.5 mm. long, glabrous, the first glume scarcely one-third as long as the spikelet.

RANGE: Swamps and moist ground, Mexico and Cuba to Paraguay. Originally described from British Guiana.

SPECIMEN FROM BRITISH GUIANA: Bartica, marshy place, *Hitchcock* 17261.

23. Panicum chnoodes Trin. Gram. Pan. 211. 1826.

Culms erect, 40 to 60 cm. tall, with a cluster of stiff basal blades, densely appressed-villous, especially toward the base, and with a hard sharp point; panicle ovoid, many-flowered, open, about 10 cm. long, the spikelets ovoid, 2 mm. long, glabrous.

RANGE: Savannas, Guiana to Brazil, whence originally described.

SPECIMEN FROM BRITISH GUIANA: Mt. Roraima, 1,050 meters, *McConnell & Quelch* 709.

24. Panicum eligulatum N. E. Brown, Trans. Linn. Soc. II. Bot. 6[1]: 73. 1901.

Resembling *P. chnoodes*, but the scabrous blades glabrous except toward base; panicles smaller and narrower, the spikelets 3 mm. long.

RANGE: Rocky soil. Known only from Mt. Roraima.

SPECIMEN FROM BRITISH GUIANA: Summit of Mt. Roraima, *McConnell & Quelch* 675.

25. Panicum rudgei Roem. & Schult. Syst. Veg. 2: 444. 1817.

Panicum pilosissimum Roth; Roem. & Schult. Syst. Veg. 2: 458. 1817.

A tufted tawny perennial with robust, often zigzag culms as much as 1 meter tall, hirsute sheaths, linear blades, terminal and axillary, open, divaricately spreading panicles, and turgid, abruptly pointed glabrous or sparsely hispid spikelets 3.5 mm. long.

RANGE: Savannas and open ground, British Honduras and Jamaica to Brazil. Originally described from British Guiana.

SPECIMENS FROM BRITISH GUIANA: Hills Estate, near Bartica, old field, *Hitchcock* 17191. Tumatumari, *Hitchcock* 17342; *Gleason* 40. Essequibo River, *Jenman* 2381. Lama, *Jenman* 5978. Macaseema, Pomeroon River, *Jenman* 7814.

26. Panicum altum Hitchc. & Chase, Contr. U. S. Nat. Herb. **17**: 488. *f.* 57. 1915.

Plants perennial, reedlike, from a decumbent tangled base, 2 to 4 meters tall, smooth and glaucous; blades 30 to 45 cm. long, 8 to 15 mm. wide; panicle open, 20 to 30 cm. long; spikelets about 3.5 mm. long, glabrous.

RANGE: Sandy marshes or flats near the coast, British Honduras to Guiana. Originally described from Panama.

SPECIMENS FROM BRITISH GUIANA: Parika, moist ground near sea, *Hitchcock* 16795. Penal Settlement, sandy bank of river, *Hitchcock* 17144. Bartica, sandy bank of Essequibo River, *Hitchcock* 17268. Ituribisci Lake, *Jenman* 2261.

27. Panicum glutinosum Swartz, Prodr. Veg. Ind. Occ. 24. 1788.

Culms 1 to 2 meters tall from a decumbent base; panicle 15 to 30 cm. long, open, the spikelets viscid, 3 mm. long, the first glume about as long as the second.

RANGE: Mountain woods, Mexico and the West Indies to Bolivia and Paraguay. Originally described from Jamaica.

SPECIMEN FROM BRITISH GUIANA: Pomeroon River, Waruwaru Creek, *Bartlett* 8124.

28. Panicum pilcomayense Hack. Bull. Herb. Boiss. II. **7**: 449. 1907.

An erect perennial about 1 meter tall, with appressed-hispid sheaths, long linear glabrous blades, and an open diffuse panicle with glabrous narrow-pointed brownish spikelets 2 to 2.5 mm. long.

RANGE: Savannas, Guiana to Paraguay, whence originally described.

SPECIMENS FROM BRITISH GUIANA: Without locality, *Schomburgk* 656, 701.

29. Panicum hirsutum Swartz, Fl. Ind. Occ. **1**: 173. 1797.

A stout erect perennial as much as 2 meters tall, with hirsute sheaths, flat glabrous blades as much as 2 cm. wide, and large, rather densely flowered panicles, the branches at first ascending, finally spreading; spikelets glabrous, acute, about 2 mm. long.

RANGE: West Indies and central Mexico to northern South America. Originally described from Jamaica.

SPECIMEN FROM BRITISH GUIANA: "Within 30 miles of Georgetown," *Rodway* 60, the specimen in the City Museum of Georgetown.

30. Panicum micranthum H. B. K. Nov. Gen. & Sp. **1**: 105. 1816.

A low, densely tufted perennial, much branched at base, with filiform leafy culms about 20 cm. tall, the upper third naked, the blades numerous, pilose, mostly 1 to 3 cm. long, becoming involute; panicles open, mostly 2 to 3 cm. long, with minute glabrous spikelets scarcely 1 mm. long.

RANGE: Sandy savannas, Venezuela to Brazil. Originally described from Venezuela.

SPECIMENS FROM BRITISH GUIANA: Head of Horeabea Creek, sandy savanna, *Hitchcock* 16952. Mt. Roraima, *Loyed* 17*.

31. Panicum polycomum Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. **1**: 306. 1834.

A low, delicate perennial, with slender culms 10 to 25 cm. tall, glabrous flat blades 1 to 3 cm. long, and small open panicles 2 to 4 cm. long, the glabrous spikelets about 1 mm. long.

RANGE: Savannas, Guiana to Brazil. Originally described from "Guian."

SPECIMENS FROM BRITISH GUIANA: Canester Falls, County Demerara (Cattle-trail Survey), *Abraham* 283. Potaro River, below the Kaieteur, *Jenman* 934, 968*. Tumatumari, *Jenman* 7475. Coast region, *Jenman* 7570.

32. Panicum errabundum Hitchc., sp. nov. FIG. 85.

Plants perennial; culms slender, glabrous, branching, decumbent-spreading, as much as 1 meter long; sheaths short, glabrous or more or less papillose-hirsute, the base often bearded; ligule about 2 mm. long, pilose, the base membranaceous; blades oblong-lanceolate, cordate at base, acute, finely pubescent on both surfaces, villous around the base, rather lax, spreading, mostly 3 to 5 cm. long, 5 to 8 mm. wide; panicles short-exserted, about 7 cm. long, nearly as wide, open, the glabrous flexuous capillary branches ascending at about 45°; spikelets oval, glabrous, obtuse, strongly nerved, slender-pediceled, 2 mm. long; first glume two-thirds to three-fourths as long as spikelets; second glume and sterile lemma about as long as the slightly apiculate fertile lemma.

Type in the U. S. National Herbarium, no. 1,038,930, collected in moist savanna, Parika, British Guiana, November 19, 1919, by A. S. Hitchcock (no. 16817). The plants were growing in a tangled mass at the base of bunches of *Paspalum densum*.

A similar species from Misiones, Argentina, with glabrous blades was figured but not described by Ekman [18] under the name *Panicum helobium* Mez.

33. Panicum parvifolium Lam. Tabl. Encycl. 1: 173. 1791.

Panicum brasiliense Spreng. Syst. Veg. 1: 321. 1825.

A slender branching, straggling decumbent perennial, the culms rising to a height of 20 to 30 cm., the short blades spreading or reflexed and usually pubescent; panicles small and open, 1 to 3 cm. long; the spikelets about 2 mm. long.

The form found here usually has pubescent blades and is like the type of *P. brasiliense* Spreng. This grades into the typical glabrous form.

RANGE: Savannas and wet places, Central America and the West Indies to Brazil. Originally described from tropical America.

SPECIMENS FROM BRITISH GUIANA: Lama Stop-off, on hummocks at the base of larger plants, marsh, *Hitchcock* 16897. Rockstone, *Gleason* 782, 790; *Hitchcock* 17287. Ituribisci Lake, *Jenman* 2226, 2239. Lamaha, *Jenman* 3861; *Ward* in 1908. Horeabea, *Jenman* 4445. Without locality, *Jenman* 5982; *Schomburgk* 407.

34. Panicum cyanescens Nees, Agrost. Bras. 220. 1829.

Resembling *P. parvifolium*, but larger, usually forming distinct tufts with ascending culms 30 to 60 cm. tall; blades mostly appressed, those of the mid-culm about 10 cm. long, 5 to 8 mm. wide; panicles 5 to 10 cm. long.

RANGE: Savannas and swamps, British Honduras to Brazil, whence originally described.

SPECIMENS FROM BRITISH GUIANA: Southeast of Lama Stop-off, sandy dike, *Hitchcock* 16966. Yawakuri Savanna, County Berbice (Cattle-trail Survey), *Abraham* 147, 175. Mt. Roraima, "our house," *Im Thurn* 261. Ituribisci Lake, *Jenman* 2256. Lama, *Jenman* 5985.

35. Panicum nervosum Lam. Encycl. 4: 747. 1798.

Panicum commelinaefolium Rudge, Pl. Guian. 21. *pl.* 28. 1805.

Stouter than *P. cyanescens*, the lower sheaths much overlapping; blades strongly nerved, cordate-clasping, widest near the base, gradually narrowing to a sharp point; panicle 10 to 15 cm. long, open, the branches ascending.

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[18] Ark. för Bot. 11⁴: 23. *pl. 1. f. 6.* 1912.

FIG. 85.—*Panicum errabundum*. From the type specimen.

RANGE: Savannas, Guiana to Brazil. Originally described from Cayenne.

SPECIMENS FROM BRITISH GUIANA: Head of Horeabea Creek, sandy savanna, *Hitchcock* 16953; *Jenman* 3725*. Lama Savanna, *Jenman* 5983*.

36. ICHNANTHUS Beauv.

Inflorescence and spikelets as in *Panicum*, the first glume often nearly as long as the spikelets, the fruit acute or subacute, the margins of the lemma usually flat, the rachilla produced below the lemma into a minute stipe, this bearing on either side membranaceous appendages adnate to the base of the lemma and free above, the appendages often wanting and indicated by minute excavations only.

Blades linear. Appendages well developed----------1. I. ichnodes.
Blades lanceolate to elliptic.
  Appendages of fertile lemma well-developed wings.
    Blades 4 to 7 cm. wide; spikelets about 7 mm. long------2. I. panicoides.
    Blades mostly less than 2 cm. wide; spikelets about 6 mm. long.
      3. I. riedelii.
  Appendages of fertile lemma reduced to scars.
    Blades lanceolate, 1 to 2 cm. wide, glabrous----------4. I. pallens.
    Blades oval to ovate-lanceolate, 1.5 to 3.5 cm. wide, often pubescent beneath.
      5. I. axillaris.

1. **Ichnanthus ichnodes** (Griseb.) Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 335. 1917.

Panicum ichnodes Griseb. Fl. Brit. W. Ind. 551. 1864.

A robust, sparingly branching perennial about 2 meters tall, with pilose or sometimes glabrate sheaths, long flat scabrous blades as much as 2.5 cm. wide, and large many-flowered panicles with whorled, finally spreading branches and blunt long-pediceled spikelets, the wings on the fertile lemma well developed, one-fourth the length of the fruit.

RANGE: Wood borders in partial shade, Trinidad, whence originally described, to Brazil.

SPECIMEN FROM BRITISH GUIANA: Kaieteur Savanna, Potaro River, *Jenman* 902.

2. **Ichnanthus panicoides** Beauv. Ess. Agrost. 57. *pl. 12. f. 1.* 1812.

Culms solitary or few in a cluster, erect or ascending, the lower part naked, the lower sheaths distant, bladeless, the upper overlapping; blades elliptic, rather thick and firm, 4 to 7 cm. wide, 2 to 3 times as long; panicle few-flowered, the spikelets about 7 mm. long.

RANGE: Floor of virgin forest, Guiana to Brazil. Originally described from tropical America.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, floor of forest, *Hitchcock* 17121. Tumatumari, *Hitchcock* 17355; *Gleason* 143, 175. Yarikita Police Station, floor of forest, *Hitchcock* 17623. Without number or locality, *Jenman**. Rockstone, *Gleason* 565. Canister Falls, *Abraham* 284.

3. **Ichnanthus riedelii** (Trin.) Doell in Mart. Fl. Bras. **2**^{2}: 278. 1877.

Panicum riedelii Trin. Gram. Icon. 3. *pl. 323.* 1832.

An erect or ascending perennial, 40 to 80 cm. tall, with falcate, narrowly elliptic blades 8 to 10 cm. long, 1.5 to 2 cm. wide, the panicle of a few distant branches; spikelets about 6 mm. long.

RANGE: Floor of the forest, Guiana to Brazil, whence originally described.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, sandy floor of forest, *Hitchcock* 17154. Kartabo, floor of forest, *Hitchcock* 17229½. Epira, Courantyne

River, *Jenman* 138*. Kalakoon, Mazaruni River, *Jenman* 2404*. Lama, *Jenman* 5994.

4. **Ichnanthus pallens** (Swartz) Munro; Benth. Fl. Hongk. 414. 1861.

Panicum pallens Swartz, Prodr. Veg. Ind. Occ. 23. 1788.

Creeping and freely branching, the culms ascending, the flat blades lanceolate, asymmetric, 1 to 2 cm. wide, glabrous; panicles with several ascending branches, terminal and axillary; spikelets 3 to 4 mm. long, glabrous.

RANGE: Rich woods and shady banks, tropics of the Western Hemisphere. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Head of Horeabea Creek, wet forest on sandhills, *Hitchcock* 16933. Near Lama Stop-off, moist woods, *Hitchcock* 16963. Penal Settlement, floor of forest, *Hitchcock* 17152. Kartabo, on old log in clearing in forest, *Hitchcock* 17219. Rockstone, wet forest, *Hitchcock* 17328. Tumatumari, shady moist soil, *Hitchcock* 17335. Issorora, opening in forest, *Hitchcock* 17548, 17557. Yarikita Police Station, shady moist soil, *Hitchcock* 17610. Coast region, *Jenman* 1508*. Essequibo River, *Jenman* 2382*. Without locality, *Schomburgk* 367.

5. **Ichnanthus axillaris** (Nees) Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 334. 1917.

Panicum axillare Nees, Agrost. Bras. 141. 1829.

Similar to *I. pallens*, but the blades wider in proportion to the length, sometimes puberulent on one or both surfaces and the spikelets often sparsely hispid.

In open ground the plants may be robust, as much as a meter tall. On the forest floor the plants may be prostrate and matlike with rounded inflorescence.

RANGE: Moist, more or less shaded slopes, Santo Domingo to Ecuador and Brazil. Originally described from Brazil.

SPECIMENS FROM BRITISH GUIANA: Tumatumari, trail to Washerwomans Fall, floor of forest, *Hitchcock* 17352, 17376. Potaro, on new land from gold dredge, *Hitchcock* 17409, 17411. Akyma, shady bank, *Hitchcock* 17413. Mackenzie, moist open ground, *Hitchcock* 17462. Issorora, edge of forest, in low ground, *Hitchcock* 17542, 17554, 17562. Portage at head of Yarikita River, open shady ground, *Hitchcock* 17594. Macouria River, *Jenman* 2425*. Lama, *Jenman* 5972*. Barima River, *Jenman* 7074*. Tumatumari, *Gleason* 115.

37. LASIACIS (Griseb.) Hitchc.

Inflorescence of open (rarely compact) panicles terminating the culm and leafy branches; spikelets subglobose, placed obliquely on their pedicels; glumes and sterile lemma broad, papery, shining, glabrous, commonly lanate at the apex; fruit white, bony-indurate, obovoid, both lemma and palea bearing at the apex, in a slight crateriform excavation, a tuft of woolly hairs, the palea concave below, gibbous above, the apex often free at maturity; woody-stemmed clambering (rarely creeping) perennials.

Culms scarcely woody, erect; blades cordate-clasping; panicle as much as 1 meter long ..... 1. L. procerrima.

Culms woody, much branched; blades narrowed at base; panicles not more than 20 cm. long.

Ligule noticeable, brownish, about 2 mm. long; blades pubescent beneath. ..... 2. L. ligulata.

Ligule hidden within the mouth of the sheath; blades usually pubescent on both surfaces ..... 3. L. sorghoidea.

1. Lasiacis procerrima (Hack.) Hitchc. Proc. Biol. Soc. Washington **24**: 145. 1911.

Panicum procerrimum Hack. Oesterr. Bot. Zeitschr. **51**: 431. 1901.

Culms several in a clump, succulent, as much as 4 meters tall; blades cordate-clasping, as much as 40 cm. long and 5 cm. wide; panicle as much as 1 meter long, the branches naked below; spikelets scattered, 3 to 4 mm. long.

RANGE: Banks and open woods, Central Mexico to Guiana. Originally described from Costa Rica.

SPECIMEN FROM BRITISH GUIANA: Potaro River, Kaieteur Savanna, *Jenman* 813.

2. Lasiacis ligulata Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 337. 1917.

Plants branched, woody, clambering to the height of 5 to 10 meters; ligule 1 to 2 mm. long; blades narrowly lanceolate, 6 to 12 cm. long, narrowed at base, puberulent beneath; panicles 5 to 10 cm. long, the spikelets obovoid, 4 mm. long, black and hard at maturity.

RANGE: Copses and open forest, Guatemala to Ecuador and Brazil. Originally described from Trinidad.

SPECIMENS FROM BRITISH GUIANA: Tumatumari, among bushes on hillside, *Hitchcock* 17345; *Gleason* 70. Issorora, *Hitchcock* 17553, 17567. Aruka River, *Bartlett* 8576. Pomeroon River, *Bartlett* in 1904. Orealla, Courantyne River, *Jenman* 257*. Pomeroon, *Jenman* 1916*. Bartica, *Jenman* 2053*. Berbice River, *Jenman* 3593*. Upper Demerara River, *Jenman* 4089. Also *Meyer*, a fragment from the Trinius Herbarium labeled "*Panicum glutinosum* Fl. Esseq."

This species was erroneously referred by Meyer [14] to *Panicum glutinosum* Lam.

3. Lasiacis sorghoidea (Desv.) Hitchc. & Chase, Contr. U. S. Nat. Herb. **18**: 338. 1917.

Panicum lanatum Swartz, Prodr. Veg. Ind. Occ. 24. 1788. Not *P. lanatum* Rottb. 1776.

Panicum sorghoideum Desv.; Hamilt. Prodr. Pl. Ind. Occ. 10. 1825.

Erect or clambering to a height of 5 to 7 meters, with a strong central cane as much as 1 cm. thick, the main branches 1 meter or more long, arcuate, bearing slender branchlets toward the pendent ends; sheaths and both surfaces of the blades velvety, or the sheaths glabrescent, the blades of the main branches commonly 20 cm. long and 2.5 cm. wide, those of the branchlets much smaller, often less velvety; panicles usually about 10 to 20 cm. long, at maturity as wide or wider, the spikelets more or less clustered on the long distant branches.

RANGE: Ravines, wood borders, and hedges, Mexico and the West Indies to Paraguay. Originally described from Porto Rico.

SPECIMEN FROM BRITISH GUIANA: Orealla, Courantyne River, *Jenman* 256.

38. SACCIOLEPIS Nash.

Inflorescence a narrow spikelike panicle; spikelets pointed, the second glume and sterile lemma inflated (the glume more or less saccate), much larger than the minutely stipitate fruit.

Spikelets 4 mm. long on slender pedicels ..... 1. S. striata.
Spikelets 2 mm. long, subsessile ..... 2. S. myuros.

1. Sacciolepis striata (L.) Nash, Bull. Torrey Club **30**: 383. 1903.

Holcus striatus L. Sp. Pl. 1048. 1753.

Panicum striatum Lam. Tabl. Encycl. **1**: 172. 1791.

Panicum gibbum Ell. Bot. S. C. & Ga. **1**: 116. 1816.

Hymenachne striata Griseb. Fl. Brit. W. Ind. 554. 1864.

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[14] Prim. Fl. Esseq. 62. 1818.

An aquatic or semiaquatic glabrous perennial, the culm 1 to 2 meters long, rooting at the geniculate lower nodes, bearing a few erect branches, with long flat blades and narrow panicles 10 to 20 cm. long.

RANGE: Swamps and ditches, southeastern United States to Guiana. Originally described from Virginia.

SPECIMENS FROM BRITISH GUIANA: Parika, old rice field, *Hitchcock* 16813. Baramanni Waini River, *Becket* 8453. Horeabea, *Jenman* 4450. Pomeroon River, *Stockdale* in 1909*.

2. **Sacciolepis myuros** (Lam.) Chase, Proc. Biol. Soc. Washington 21: 7. 1908.

Panicum myuros Lam. Tabl. Encycl. 1: 172. 1791.

Panicum myosurus L. Rich. Act. Soc. Hist. Nat. Paris 1: 106. 1792.

Hymenachne myuros Beauv. Ess. Agrost. 49, 165. 1812.

A slender glabrous annual as much as 1 meter tall, with elongate linear blades, the panicles compact, spikelike, about 5 mm. thick.

RANGE: Swamps and wet places, Mexico and Cuba to Brazil. Originally described from Cayenne.

SPECIMENS FROM BRITISH GUIANA: Parika, old rice field, *Hitchcock* 16814. Lama Stop-off, *Jenman* 4529. Lama Savanna, *Jenman* 5984*, 6029, 6030*.

39. HYMENACHNE Beauv.

Spikelets short-pedicellate in long, dense, spikelike or interrupted panicles; spikelets acuminate; lemma and palea scarcely indurate, the margins of the lemma flat, the palea not inclosed above.

Inflorescence dense, spikelike.....1. **H. amplexicaulis.**
Inflorescence long and narrow with ascending branches, not spikelike.
2. H. auriculata.

1. **Hymenachne amplexicaulis** (Rudge) Nees, Agrost. Bras. 276. 1829.

Panicum amplexicaule Rudge, Pl. Guian. 21. *pl.* 27. 1805.

A glabrous perennial with succulent, sparingly branching culms, broad linear cordate-clasping blades, the panicles about 8 mm. thick and 20 to 50 cm. long.

RANGE: Swamps and shallow water, often forming pure colonies. Tropics and subtropics of both hemispheres. Originally described from British Guiana.

SPECIMENS FROM BRITISH GUIANA: Vreed-en-Hoop, along ditch 3 miles west, *Hitchcock* 16740. Morawhanna, wet ground, *Hitchcock* 17512. Coast region, *Jenman* 4380, 4589. Horeabea, *Jenman* 4449. Lamaha, *Jenman* 6044. Pomeroon River, *Stockdale* in 1909*. Also *Meyer*, a fragment from the Trinius Herbarium labeled "Fl. Esseq."

2. **Hymenachne auriculata** (Willd.) Chase, Proc. Biol. Soc. Washington 21: 5. 1908.

Panicum auriculatum Willd. in Spreng. Syst. Veg. 1: 322. 1825.

Similar to *H. amplexicaulis*, olivaceous throughout (at least when dry), the panicles of numerous ascending, densely flowered branches, the lower distant.

RANGE: River banks and shallow water, Cuba to Brazil. Originally described from tropical America, no definite locality given.

SPECIMENS FROM BRITISH GUIANA: Parika, along ditch, *Hitchcock* 16810. Georgetown, in water of canal, *Hitchcock* 16972. Issorora, in water of ditch, *Hitchcock* 17587. Essequibo River, *Jenman* 1116.

40. HOMOLEPIS Chase.

Inflorescence paniculate; spikelets rather large, subfusiform; first and second glume equal or the first slightly the longer, 7 to 9-nerved, the pair wholly covering the sterile and fertile florets; sterile lemma nearly as long as the glumes,

broad, infolding the fertile lemma, and inclosing a narrow hyaline palea and sometime a staminate flower; fruit elliptic, pointed, smooth and shining, the lemma and palea less indurate than in *Panicum*, the margins of the lemma flat.

1. **Homolepis isocalycia** (Meyer) Chase, Proc. Biol. Soc. Washington **24**: 147. 1911.

Panicum isocalycium Meyer, Prim. Fl. Esseq. 59. 1818.

A slender branched straggling perennial clambering to the height of 2 to 3 meters, with oval panicles, 8 to 10 cm. long, pubescent in the lower axils; spikelets about 5 mm. long, the sterile lemma glabrous.

RANGE: Edge of forest in damp places, Guiana to Brazil. Originally described from British Guiana.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, edge of jungle along river, *Hitchcock* 17112. Mazaruni River, *Bartlett* 8059. Lamaha Dam, *Jenman* 6000 (*Panicum zizanioides* is mixed with this.)

41. ISACHNE R. Br.

Inflorescence paniculate; spikelets small, subglobose; glumes subequal; lower floret perfect or staminate, its lemma and palea indurate and similar in form and texture to those of the upper floret; both fruits plano-convex, nearly equal in size, usually remaining attached by the minute rachilla joint between them.

1. **Isachne polygonoides** (Lam.) Doell in Mart. Fl. Bras. **2²**: 273. 1877.

Panicum polygonoides Lam. Encycl. **4**: 742. 1798.

Isachne trachysperma Nees in Seem. Bot. Herald 224. 1857.

Flowering shoots 20 to 30 cm. tall, erect from a long, creeping, freely branching culm, rooting at the nodes, the whole plant often a meter in length, the erect shoots finally bearing fascicled branchlets, the sheaths hispid, the spreading lanceolate-ovate blades very scabrous; panicles included at base, about 5 cm. long and as broad, loosely many-flowered.

RANGE: Moist ground, Central America to Brazil. Originally described from Cayenne.

SPECIMEN FROM BRITISH GUIANA: Bartica, along the wet shore, *Jenman* 5975.

42. OPLISMENUS Beauv.

Inflorescence of several thick racemes along a common axis; spikelets subsessile; glumes and sterile lemma awned or mucronate; fruit as in *Panicum*, acute.

1. **Oplismenus hirtellus** (L.) Beauv. Ess. Agrost. 54, 168. 1812.

Panicum hirtellum L. Syst. Nat. ed. 10. **2**: 870. 1759.

A slender, creeping, branching perennial, the ascending or erect flower culms 30 to 50 cm. tall, the lanceolate blades undulate-margined; racemes ascending or spreading, as much as 3 cm. long, usually 1 to 2 cm.

RANGE: Moist woods and shady banks, throughout tropical America. Originally described from Jamaica.

SPECIMEN FROM BRITISH GUIANA: Georgetown, Promenade Gardens, *Hitchcock* 16597.

Oplismenus burmanni (Retz.) Beauv., with pilose sheaths and villous racemes, is represented in the Jenman Herbarium by two specimens, one having a printed label, "Garden plants. Cultivated in the British Guiana Botanic Gardens," with no data but the number (4201) and year (1888). The other has a printed Jenman label but no data except the year (1888).

43. ECHINOCHLOA Beauv.

Inflorescence paniculate, the usually compact, densely flowered panicle composed of 1-sided racemes or of subsimple branches; spikelets hispid or spiny; glumes usually mucronate; sterile lemma usually awned; fruit subindurate, acuminate-pointed, the summit of the palea not inclosed.

Spikelets awnless or mucronate only; racemes simple, rather remote.
1. E. colonum.

Spikelets more or less awned; racemes subcompound, approximate.
Ligule obsolete; spikelets, excluding awns, 3 to 4 mm. long.
2. E. crusgalli crus-pavonis.

Ligule of stiff yellow hairs; spikelets, excluding awns, 5 to 6 mm. long.
3. E. polystachya.

1. Echinochloa colonum (L.) Link, Hort. Berol. **2**: 209. 1833.

Panicum colonum L. Syst. Nat. ed. 10. **2**: 870. 1759.

A glabrous tufted annual, the culms compressed, branching at the more or less decumbent base; blades flat, linear, about 5 mm. wide, sometimes barred with purplish brown; racemes usually 5 to 10, ascending, distant nearly their own length on the strict axis.

RANGE: Ditches and moist places in the warmer parts of both hemispheres; introduced in America. Originally described from America.

SPECIMENS FROM BRITISH GUIANA: Georgetown, a weed along ditches, *Hitchcock* 16604. Coast lands, *Jenman* 4515, 6023*, 6031*.

2. Echinochloa crusgalli crus-pavonis (H. B. K.) Hitchc. Contr. U. S. Nat. Herb. **22**: 148. 1920.

Oplismenus crus-pavonis H. B. K. Nov. Gen. & Sp. 1: 108. 1816.

Panicum sabulicola Nees, Agrost. Bras. 258. 1829.

An erect, often robust, usually fleshy annual, with nearly simple culms often decumbent and rooting at base, and long narrow nodding panicles of usually long-awned spikelets; sheaths sometimes hirsute or papillose.

RANGE: Swamps and ditches, throughout tropical America. Originally described from Venezuela.

SPECIMENS FROM BRITISH GUIANA: Without locality, *Jenman* 5991; *Schomburgk* 151 (a long-awned form). Georgetown, *Rodway* 43.

3. Echinochloa polystachya (H. B. K.) Hitchc. Contr. U. S. Nat. Herb. **22**: 135. 1920.

Oplismenus polystachyus H. B. K. Nov. Gen. & Sp. **1**: 107. 1816.

Panicum spectabile Nees in Trin. Gram. Pan. 138. 1826.

A robust fleshy perennial, the tall culms erect from a creeping base, the nodes usually villous, the blades as much as 3 cm. wide, the narrow, densely flowered panicle erect or nearly so.

RANGE: Swamps near the coast, southern Mexico and the West Indies to Paraguay. Originally described from Colombia.

SPECIMENS FROM BRITISH GUIANA: West of Vreed-en-Hoop, in water of canal, *Hitchcock* 16695, 16791. Pomeroon River, *Jenman* 1619*. New Amsterdam, *Jenman* 4603. Canje River, *Jenman* 5973*. Marlborough, *Jenman* 7795. Hyde Park, Demerara River, *Jenman* in 1889*.

44. CHAETOCHLOA Scribn.

(*Setaria* Beauv.)

Inflorescence a dense spikelike (rarely loose) panicle, the spikelets solitary or in small clusters subtended by 1 to several slender scabrous bristles (sterile

branchlets), these persistent after the fall of the spikelets; spikelets as in *Panicum*, turgid, the fruit usually transversely rugose.

Bristles antrorsely scabrous, 5 to 12 at the base of each spikelet; inflorescence a dense cylindric spikelike panicle----------1. **C. geniculata.**
Bristles retrorsely scabrous, 1 to 3 below each spikelet; inflorescence somewhat loose or interrupted----------2. **C. tenax.**

1. **Chaetochloa geniculata** (Lam.) Millsp. & Chase, Field Mus. Bot. 3: 37. 1903.

Panicum geniculatum Lam. Encycl. 4: 727 (err. typ. 737). 1798.
Setaria purpurascens **H. B. K. Nov. Gen. & Sp. 1: 110. 1816.**
Panicum imberbe Poir. in Lam. Encycl. Suppl. 4: 272. 1816.

Tufted, the slender compressed culms erect, geniculate at base, or sometimes spreading, the blades mostly 5 to 8 mm. wide, the long-exserted, dense, spikelike, yellow, or purplish panicle 5 to 10 cm. long, 6 to 8 mm. thick, excluding the bristles.

The bristles vary in length and color. Early in the season they are longer than the spikelets, but on later spikes they may be shorter than the spikelets.

RANGE: Open ground, waste places, and grassland, throughout the American tropics and northward into southern and eastern United States. Originally described from Guadeloupe.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, along canal, *Hitchcock* 16554; grassy border of ditch, *Hitchcock* 16839. Coast region, *Jenman* 4377. Lamaha Dam, *Jenman* 6012*. Kwaimatta, *Jenman* 6781*. Without locality, *Jenman* 6465*, *Schomburgk* 552.

2. **Chaetochloa tenax** (L. Rich.) Hitchc. Contr. U. S. Nat. Herb. **22**: 176. 1920.

Panicum tenax L. Rich. Act. Soc. Hist. Nat. Paris 1: 106. 1792.
Panicum impressum Nees, Agrost. Bras. 247. 1829.
Setaria biconvexa Griseb. Fl. Brit. W. Ind. 555. 1864.

Tufted, erect, commonly 1 meter tall, the culms and sheaths compressed, the numerous elongate blades mostly 0.8 to 1.2 cm. wide, usually reaching beyond the base of the rather loose panicle of large globose spikelets and long flexuous retrorsely-scabrous bristles.

RANGE: Savannas, rocky banks, and open woods, southern Mexico and the West Indies to Brazil. Originally described from Cayenne.

This was described by Grisebach [15] as *Setaria onurus*, but that name is based on a different species from Uruguay.

SPECIMENS FROM BRITISH GUIANA: Canje River, *Jenman* 1905*, 1906*. Without locality, *Schomburgk* 414.

45. PENNISETUM Pers.

Spikelets 1 to 3 together, subtended by a whorl of slender bristles (sterile branchlets), subsessile along a common axis forming bristly spikes, the bristles falling attached to the lanceolate spikelets.

1. **Pennisetum setosum** (Swartz) L. Rich. in Pers. Syn. Pl. 1: 72. 1805.

A tall leafy branching perennial, erect or ascending from a geniculate base, the long flat blades pubescent or scabrous, the purplish spikes 10 to 15 cm. long, the long slender bristles at maturity spreading horizontally or slightly reflexed.

RANGE: Grassy slopes and open woods, Florida to Brazil. Originally described from the West Indies.

SPECIMENS FROM BRITISH GUIANA: Holmia, Potaro River, *Bartlett* in 1907. Kwaimatta, *Jenman* 6797*.

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[15] Fl. Brit. W. Ind. 555. 1864.

46. CENCHRUS L.

Spikelets 1 to 4 together, subtended and surrounded by a spiny bur formed of adnate sterile branches, the burs subsessile along a common axis, falling with the spikelets and permanently inclosing them; spikelets acuminate, the first glume sometimes obsolete.

Plants annual; burs, excluding bristles, 5 to 7 mm. wide, not densely crowded; involucral lobes erect ---------- 1. C. echinatus.

Plants perennial in large tufts; burs, excluding bristles, not over 4 mm. wide, numerous, crowded in a long spike; involucral lobes interlocking. 2. C. dactylolepis.

SANDBUR.

1. Cenchrus echinatus L. Sp. Pl. 1050. 1753.

Culms usually about 50 cm. long, ascending from a decumbent base, branching below; blades flat, thin, usually elongate, 5 to 10 mm. wide; spike commonly 5 to 7 cm. long.

RANGE: Open ground and waste places; a common weed throughout the warmer parts of America. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Georgetown, along streets, *Hitchcock* 16741. Lamaha banks, *Jenman* 3645. Coast region, *Jenman* 4369, 4513*, 5964*. Also *Meyer*, a fragment from a specimen in the Trinius Herbarium, labeled "Meyer, Fl. Esseq."

2. Cenchrus dactylolepis Steud. Syn. Pl. Glum. 1: 109. 1854.

A perennial, growing in large clumps, the culms rather stout, 30 to 60 cm. tall, the shoots strongly compressed; spike 4 to 8 cm. long, 1 cm. thick.

The burs closely resemble those of *C. viridis* but the plant differs in being perennial and in the large compressed overlapping sheaths.

RANGE: Open grassland, British and Dutch Guiana. Originally described from the latter country.

SPECIMENS FROM BRITISH GUIANA: New Amsterdam, grassland along road, *Hitchcock* 16820. Upper Demerara River, *Jenman* 4011.

47. OLYRA L.

Plants monoecious; inflorescence paniculate; pistillate spikelets borne on the upper branches and on the ends of the lower branches of loose terminal panicles, the smaller staminate spikelets pedicellate along the lower branches; pistillate spikelets rather large; first glume wanting; second glume and sterile lemma herbaceous, caudate-acuminate; fruit bony-indurate; staminate spikelets readily deciduous; glumes and sterile lemma wanting, the lemma and palea membranaceous.

Fruit pubescent; panicles narrow ---------- 1. O. surinamensis.

Fruit glabrous; panicles large and somewhat spreading.

Fruit pitted, about 3 mm. long ---------- 2. O. micrantha.

Fruit smooth, more than 3 mm. long.

Blades ovate-cordate, the uppermost as much as 7 cm. wide. 3. O. cordifolia.

Blades oblong, rounded or narrowed at base, not distinctly cordate.

Pistillate spikelets, including the long point, 3 to 4 cm. long, single at the ends of ascending branches, as much as 10 to 12 cm. long. 4. O. caudata.

Pistillate spikelets mostly less than 2 cm. long, the branches of the panicle usually not over 5 cm. long ---------- 5. O. latifolia.

1. Olyra surinamensis Hochst.; Steud. Syn. Pl. Glum. 1: 36. 1854.

Differs from *O. latifolia* in the numerous narrow few-flowered appressed axillary panicles, the narrow pistillate spikelets, and the pubescent fruit.

RANGE: Wet forest and swamps, British and Dutch Guiana. Originally described from the latter country.

SPECIMENS FROM BRITISH GUIANA: Near Lama Stop-off, edge of wet forest, *Hitchcock* 16979. Penal Settlement, edge of forest by river, *Hitchcock* 17241. Rockstone, wet forest, *Hitchcock* 17332. Tumatumari, wet forest, *Hitchcock* 17363. Akyma, wet forest, *Hitchcock* 17423. Issorora, wet forest, *Hitchcock* 17577. Lama Creek, *Jenman* 5963. Demerara River, *Jenman* 6737. Berbice, *Jenman* 6813*. Barima River, *Jenman* 6992*. Potaro River, *Jenman* 7528. Banks of Yawakuri River, County Berbice (Cattle-trail Survey), *Abraham* 189.

2. Olyra micrantha H. B. K. Nov. Gen. & Sp. 1: 199. 1816.

Growing to the height of 3 to 5 meters, the blades as much as 30 cm. long and 10 cm. wide, rounded but scarcely cordate at base, the panicles as much as 30 cm. long; fruits pitted, 3 mm. long.

The pistillate spikelets are much smaller than in any of the other species of the region.

RANGE: Rich woods, Guiana to Paraguay. Originally described from Brazil.

SPECIMENS FROM BRITISH GUIANA: Rockstone, wet forest, *Hitchcock* 17283; *Jenman* 7548; *Gleason* 624. Essequibo River, *Jenman* 2384*. Upper Demerara River, *Jenman* 4119. Demerara River, *Jenman* 6674*. Mt. Roraima, 1,050 meters, *McConnell & Quelch* 708.

3. Olyra cordifolia H. B. K. Nov. Gen. & Sp. 1: 198. 1816.

Resembling *O. latifolia*, but differing in the ovate-oblong blades with a cordate base.

RANGE: Forests, Guiana and Colombia to Paraguay. Originally described from Colombia.

SPECIMEN FROM BRITISH GUIANA: Without locality, *Schomburgk* 672.

4. Olyra caudata Trin. Linnaea 10: 292. 1836.

Differs from *O. latifolia* in having the main panicle branches as much as 10 or 12 cm. long, with a single pistillate spikelet at the summit and numerous staminate spikelets below, the point of the pistillate spikelet 2 to 3 cm. long.

RANGE: Forests, Guiana to Peru. Originally described from the latter country.

SPECIMEN FROM BRITISH GUIANA: Cabalebo, Courantyne River, *Jenman* 134.

5. Olyra latifolia L. Syst. Nat. ed. 10. 2: 1261. 1759.

Olyra paniculata Swartz, Prodr. Veg. Ind. Occ. 21. 1788.

Olyra arundinacea H. B. K. Nov. Gen. & Sp. 1: 197. 1816.

Glabrous perennial, bamboo-like in aspect, commonly 5 meters tall, the strong hollow culms sometimes 1 cm. thick, erect and unsupported, the summit only arching (or weaker culms leaning among brush), the lower half to two-thirds simple and naked, the short sheaths bladeless or nearly so, the elongate internodes blotched with dull purple, branching from the upper nodes, the branches commonly fascicled, divaricate, often 1 meter long, sometimes again branching; blades convolute in the bud, spreading, flat, firm, asymmetrically lanceolate-oblong, abruptly acuminate, commonly 20 cm. long and 5 cm. wide, those of the ultimate branches smaller, the lowermost on both primary culm and branches rudimentary; panicles 10 to 15 cm. long, about two-thirds as wide, those of the secondary branches reduced, the branches stiffly ascending or spreading, each bearing a single large long-acuminate pistillate spikelet at the thickened summit and several small slender-pediceled staminate spikelets along the rachis.

RANGE: Copses and edge of forests, throughout tropical America. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: Near Bartica, edge of forest, *Hitchcock* 17253. Akyma, shady hillside, *Hitchcock* 17416. Short Cut Waini River, *Becket* in 1906. Epira, Courantyne River, *Jenman* 92*. Lama, *Jenman* 5981. Berbice, *Jenman* 6501*.

48. RADDIA Bertol.

Plants monoecious; staminate and pistillate spikelets in distinct small panicles, the staminate terminal or from the upper nodes, the pistillate axillary; first glume of the pistillate spikelets wanting, the second glume and sterile lemma membranaceous, acuminate; fruit dorsally subcompressed, bony-indurate.

Blades glabrous, firm, triangular-oblong, tapering from a truncate base to the rounded summit, 5 to 7 mm. wide at base ..... 1. R. nana.
Blades pubescent, thin, elliptic or elliptic-oblong, mostly 3 to 4 mm. wide. 2. R. malmeana.

1. **Raddia nana** (Doell) Chase, Proc. Biol. Soc. Washington **21**: 185. 1908.
Olyra nana Doell in Mart. Fl. Bras. **2**²: 329. 1877.

A tufted straggling perennial with delicate, nearly simple culms, 10 to 30 cm. long, naked below, the small, flat, oblong-triangular, spreading or deflexed blades 10 to 12 mm. long, 5 to 7 mm. wide, the apex rounded, abruptly mucronate, approximate along the upper part of the culm, the small few-flowered axillary racemes scarcely exserted from the upper sheaths.

RANGE: Wet sandy savannas, Trinidad to Brazil, whence originally described.

SPECIMEN FROM BRITISH GUIANA: Lama Dam, near Matawini Creek, *Jenman* 5971.

2. **Raddia malmeana** (Ekman) Hitchc.
Olyra malmeana Ekman, Ark. för Bot. **10**: 21, *pl. 2. f. 3; pl. 6. f. 9.* 1911.

A delicate tufted perennial, the slender culms 5 to 10 cm. tall; sheaths mostly shorter than the internodes, pilose at the summit; blades thin, pubescent, elliptic or elliptic-oblong, 10 to 13 mm. long, 3 to 4 mm. wide; pistillate spikelet pubescent, about 1.5 mm. long.

RANGE: Savannas, Guiana to Brazil. Originally described from Matto Grosso, Brazil.

SPECIMEN FROM BRITISH GUIANA: Kaieteur Savanna, Potaro River, *Jenman* 1277.

49. IMPERATA Cyrillo.

Spikelets all perfect, awnless, all pedicellate, articulate below the glumes, the rachis not disjointing, the slender racemes in a narrow spikelike panicle; glumes membranaceous, densely clothed with long silky hairs.

Panicle rarely over 10 cm. long; spikelets 4 mm. long ..... 1. I. brasiliensis.
Panicle and blades elongate; spikelets 3 mm. long ..... 2. I. contracta.

1. **Imperata brasiliensis** Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2**: 331. 1832.

An erect tufted perennial with scaly rhizomes, the flat leaves mostly clustered toward the base, the slender, simple, nearly naked culm 0.5 to 1 meter tall, with a pale silky narrow panicle.

RANGE: Open rather dry ground at low altitudes, Bahamas and southern Mexico to Brazil. Originally described from Brazil.

SPECIMENS FROM BRITISH GUIANA: Parika, along railroad, *Hitchcock* 16815. Lamaha, No. 1 Benab, *Jenman* 4567. Without locality, *Schomburgk* 665.

2. **Imperata contracta** (H. B. K.) Hitchc. Rep. Mo. Bot. Gard. 4: 146. 1893.
Saccharum contractum H. B. K. Nov. Gen. & Sp. 1: 182. 1816.
Imperata caudata Trim. Mém. Acad. St. Pétersb. *VI.* Math. Phys. Nat. 2: 331. 1832.

Taller than the preceding, the culms leafy, the panicle as much as 40 cm. long.

RANGE: Swamps and moist open ground, southern Mexico and the West Indies to northern South America. Originally described from Colombia.

SPECIMENS FROM BRITISH GUIANA: Akyma, grassland in wet clearing, *Hitchcock* 17429. Morawhanna, a weed in field, *Hitchcock* 17506. Canje River, *Jenman* 1903. Coast region, *Jenman* 4576. Lamaha Savanna, *Jenman* 6034.

Sugarcane (*Saccharum officinarum* L. Sp. Pl. 54. 1753) is commonly cultivated and may occur spontaneously, though all the specimens in our collections are from cultivated plants. This is a gigantic perennial with broad leaves, the overlapping sheaths falling from the short-jointed lower part of the culms, the great plumy panicles pinkish silvery. Seed is produced sparingly.

Cultivated in tropical and subtropical countries of both hemispheres. Originally described from India.

50. ANDROPOGON L.

Sessile spikelet perfect, usually awned; pedicellate spikelet staminate or neuter; rachis articulate; racemes solitary, digitate, or approximate along a continuous main axis.

Spikelets awned.
  First glume with a pit like a pin hole in the back.
    1. A. pertusus panormitanus.
  First glume without a pit.
    Culm villous below the inflorescence ..... 2. A. nodosus.
    Culm glabrous below the inflorescence.
      Glumes of sessile spikelets papillose-hispid, obscurely nerved, obtusely rounded, closely overlapping ..... 3. A. annulatus.
      Glumes of sessile spikelets softly villous, strongly nerved, acute, loosely overlapping ..... 4. A. ischaemum.
Spikelets awnless.
    Spikelets glabrous ..... 5. A. virgatus.
    Spikelets woolly.
      Inflorescence large, club-shaped, the numerous ascending or appressed branches forming a compound panicle; plant 1 meter or more tall.
        6. A. bicornis.
      Inflorescence of several long-peduncled pairs of racemes; plants slender, 30 to 60 cm. long.
        Sessile spikelets about 3 mm. long; blades usually not over 2 mm. wide, the apex acute ..... 7. A. leucostachyus.
        Sessile spikelets about 4 mm. long; blades 3 to 5 mm. wide, the apex boat-shaped ..... 8. A. selloanus.

1. **Andropogon pertusus panormitanus** (Parl.) Hack. in DC. Monogr. Phan. 6: 481. 1889. BARBADOS SOURGRASS.
Andropogon panormitanus Parl. "in Diar. Congr. Venezia 1847"; Fl. Ital. 1: 140. 1848.

An ascending branching tufted perennial with glabrous nodes and nearly glabrous blades and somewhat fan-shaped panicles of several villous racemes with twisted bent awns about 1 cm. long.

RANGE: Roadsides and open grassy places, warmer parts of the Old World. Originally described from Sicily.

SPECIMEN FROM BRITISH GUIANA: From Barbados, "a valuable grass." 7686, a cultivated specimen, the collector not given.

2. **Andropogon nodosus** (Willem.) Nash, N. Amer. Fl. **17**: 122. 1912.

Dichanthium nodosum Willem. Ann. Bot. Usteri **18**: 11. 1796.

A decumbent, freely branched, low perennial with flat blades, 2 to 8 cm. long, and solitary or paired racemes, the sterile spikelets as conspicuous as the fertile ones, giving the appearance of a flat 2-ranked scaly spike; awns slender, twisted, and bent.

RANGE: Waste places; introduced in a few places in the West Indies from the tropics of the Old World. Originally described from Mauritius.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Botanic Gardens, grassland, *Hitchcock* 16614; *Kartright* in 1912.

3. **Andropogon annulatus** Forsk. Fl. Aegyp. Arab. 173. 1775.

Resembling *A. pertusus panormitanus*, but differing in the absence of the pit on the back of the glumes and in the more imbricate spikelets; nodes bearded.

RANGE: A native of the Old World, originally described from Egypt.

SPECIMEN FROM BRITISH GUIANA: Georgetown, Botanic Gardens, grassland, *Hitchcock* 16551.

4. **Andropogon ischaemum** L. Sp. Pl. 1047. 1753.

Resembling *A. annulatus*, but the racemes more slender and rather more numerous.

RANGE: A native of the Old World. Originally described from Europe.

SPECIMEN FROM BRITISH GUIANA: Georgetown, Botanic Gardens, grassland, *Hitchcock* 16549.

5. **Andropogon virgatus** Desv.; Hamilt. Prodr. Pl. Ind. Occ. 9. 1825.

Andropogon spathiflorus Kunth, Enum. Pl. **1**: 496. 1833.

Anatherum spathiflorum Griseb. Cat. Pl. Cub. 236. 1866.

A tall glabrous tufted perennial with compressed rigid culms, long linear blades, and elongate panicles of small glabrous racemes partly inclosed in rufous or purplish spathes.

RANGE: Wet sandy open swamps or savannas, West Indies and Central America to Brazil. Originally described from the "Antilles."

SPECIMENS FROM BRITISH GUIANA: Southeast of Lama Stop-off, dike along canal, *Hitchcock* 16965. Lama Savanna, *Jenman* 5988. Without locality, *Schomburgk* 666.

6. **Andropogon bicornis** L. Sp. Pl. 1046. 1753.

A tall robust tufted perennial, with long linear blades scabrous on the margin, and a large feathery corymbose inflorescence of delicate racemes, one, sometimes two, of the uppermost pediceled spikelets larger than the fertile ones, the other pediceled spikelets rudimentary.

RANGE: Savannas and open ground, southern Mexico and the West Indies to Brazil. Originally described from Jamaica.

SPECIMENS FROM BRITISH GUIANA: West of Vreed-en-Hoop, low ground, *Hitchcock* 16724. Parika, moist meadow, *Hitchcock* 16760. Kyk-over-al Island, open ground, *Hitchcock* 17201. Akyma, wet clearing, *Hitchcock* 17430. Morawhanna, in wet field, *Hitchcock* 17505. Canje River, *Jenman* 1898*. Bartica, *Jenman* 2459*. Lama Savanna, *Jenman* 5989, 5990. Rupununi Savanna, *Melville*. Without locality, *Schomburgk* 761. Also *Meyer*, a fragment from a specimen in the Trinius Herbarium labeled "Fl. Esseq." Potaro Landing, *Gleason* 257.

7. Andropogon leucostachyus H. B. K. Nov. Gen. & Sp. 1: 187. 1816.

A slender, densely tufted, erect perennial, the elongate blades with a deeply impressed midvein; racemes 2 or 3 on slender exserted peduncles, the spikelets obscured by the copious long silky hairs.

RANGE: Cliffs and grassy slopes, southern Mexico and the West Indies to Brazil. Originally described from Venezuela.

SPECIMENS FROM BRITISH GUIANA: Penal Settlement, rocky hill, *Hitchcock* 17161. Wismar, sand hills, *Hitchcock* 17274. Mackenzie, grassland in clearing, *Hitchcock* 17464. Upper Demerara River, *Jenman* 4062.

8. Andropogon selloanus (Hack.) Hack. Bull. Herb. Boiss. II. 4: 266. 1904.

Andropogon leucostachyus var. *selloanus* Hack. in DC. Monogr. Phan. 6: 420. 1889.

Similar to the preceding, stouter, the blades shorter, broader, and with a boat-shaped tip; racemes often 5 or 6.

RANGE: Savannas and open ground, West Indies to Paraguay. Originally described from Brazil.

SPECIMEN FROM BRITISH GUIANA: Kwaimatta, *Jenman* 6183.

51. CYMBOPOGON Spreng.

Racemes 2, on slender peduncles, subtended by a spathelike sheath, a staminate awnless spikelet borne at the summit of the peduncle in the fork of the two racemes, one or both of the racemes sometimes again forking at the lower joints with a staminate spikelet in the fork, one of the secondary racemes reduced to a single joint.

1. Cymbopogon bracteatus (Humb. & Bonpl.) Hitchc. Contr. U. S. Nat. Herb. 17: 209. 1913.

Andropogon bracteatus Humb. & Bonpl.; Willd. Sp. Pl. 4: 914. 1806.

An erect perennial a meter or more tall, the sheaths more or less hispid, especially near the summit, the blades long and narrow, appressed-hispid beneath; panicle narrow, 10 to 20 cm. long, terminal and axillary, the upper branches of the main culm appressed, the panicles combining with that of the main culm to form a compound inflorescence; bracts of spathes of the pairs of racemes short and narrow, 1 to 2 cm. long, appressed-hispid; peduncles of the pair of racemes and the axil of the pair villous; racemes mostly less than 1 cm. long, few-flowered, the awns about 2 cm. long.

RANGE: Savannas, southern Mexico to Brazil. Originally described from Venezuela.

SPECIMEN FROM BRITISH GUIANA: Rupununi Savanna, *Melville*.

52. ANATHERUM Beauv.

Racemes long, slender, on long filiform peduncles borne in whorls on an elongate axis, forming a large panicle; spikelets awnless, arranged as in *Andropogon*, the filiform rachis tardily disjointing.

1. Anatherum zizanioides (L.) Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 285. 1917.

KHUSKHUS.

Phalaris zizanioides L. Mant. Pl. 2: 183. 1771.

Andropogon muricatus Retz. Obs. Bot. 3: 43 [31]. 1783.

Vetiveria arundinacea Griseb. Fl. Brit. W. Ind. 559. 1864.

A robust, densely tufted, erect, branching perennial with scabrous-margined blades, elongate-pyramidal panicles, and muricate spikelets.

RANGE: Commonly cultivated in the American tropics as a hedge plant and for its aromatic roots, which are used for mats and screens. Sometimes escaped along roadsides. Originally described from India.

SPECIMEN FROM BRITISH GUIANA: Parika, along ditch, *Hitchcock* 16809.

53. HOLCUS L.

Racemes reduced to 1 to 5 joints, borne on slender peduncles on the slender branches of a compound panicle; rachis slender, tardily disjointing; spikelets arranged as in *Andropogon*, the pedicellate spikelet usually staminate, the sessile spikelets awnless or with a deciduous awn.

1. **Holcus sorghum** L. Sp. Pl. 1047. 1753. SORGHUM or SORGO.

A large broad-leaved annual, with a compact panicle of turgid persistent spikelets.

RANGE: Occasionally cultivated and sometimes spontaneous in waste places or near fields. Widely cultivated in the warmer parts of America and in the Old World, whence originally described.

SPECIMEN FROM BRITISH GUIANA: Demerara River, naturalized at settlement, *Jenman* 3961.

Sometimes called Guinea corn.

1a. **Holcus sorghum sudanensis** (Piper) Hitchc. Proc. Biol. Soc. Washington **29**: 128. 1916. SUDAN GRASS.

Andropogon sorghum sudanensis Piper, Proc. Biol. Soc. Washington **28**: 33. 1915.

More slender than the typical form, with an open panicle, the blades often only 1 cm. wide.

RANGE: Coming into cultivation in the West Indies and British Guiana in recent years and sparingly escaped. Described from a cultivated specimen grown from seed from the Sudan.

SPECIMEN FROM BRITISH GUIANA: New Amsterdam, waste places, well established, *Hitchcock* 16818.

54. ERIOCHRYSIS Beauv.

Spikelets awnless, the sessile spikelets perfect, the pedicellate spikelets pistillate, smaller but fruitful, readily falling, the rachis rather tardily disjointing; racemes short, crowded in a narrow dense silky interrupted spikelike panicle.

1. **Eriochrysis cayennensis** Beauv. Ess. Agrost. 8. *pl. 4. f. 11.* 1812. (Beauvois spells the name "*Cayancnsis.*")

An erect unbranched perennial 1 to 2 meters or more tall, the long narrow blades densely velvety, the compact silky golden-brown panicle 10 to 12 cm. long.

RANGE: Moist slopes and savannas, southern Mexico and the West Indies to Uruguay. The type locality is presumably Cayenne, though no locality is mentioned in the original description.

SPECIMENS FROM BRITISH GUIANA: Mt. Roraima, "our house," *Im Thurn* 246. Without locality, *Schomburgk* 654. "Within 30 miles of Georgetown," *Rodway* 81, the specimen in the City Museum of Georgetown.

55. HETEROPOGON Pers.

Racemes solitary, the lower part of the rachis not disjointing, bearing 2 to 5 pairs of staminate awnless spikelets, the upper part of the rachis disarticu-

lating obliquely at the base of each joint, each forming a sharp callus below the long-awned sessile perfect spikelet, the pedicellate spikelet staminate.

1. **Heteropogon contortus** (L.) Beauv.; Roem. & Schult. Syst. Veg. **2**: 836. 1817.

Andropogon contortus L. Sp. Pl. 1045. 1753.

Andropogon secundus Willd.; Nees, Agrost. Bras. 364. 1829.

A tall branching annual with compressed culms, keeled sheaths, scabrous blades, and solitary racemes of imbricate spikelets, the lower awnless, the upper with long brown bent awns.

Lemon-scented when fresh.

RANGE: Rocky slopes, warmer parts of both hemispheres. Originally described from India.

SPECIMEN FROM BRITISH GUIANA: Without locality, *Schomburgk* 762.

56. TRACHYPOGON Nees.

Perfect spikelet awned, pedicellate, the pedicel disjointing obliquely, forming a sharp callus below the spikelet; staminate spikelet subsessile, persistent on the slender continuous rachis; racemes solitary or few to several, digitate.

1. **Trachypogon plumosus** (Humb. & Bonpl.) Nees, Agrost. Bras. 344. 1829.

Andropogon plumosus Humb. & Bonpl.; Willd. Sp. Pl. **4**: 918. 1806.

Trachypogon polymorphus var. *plumosus* Hack. in Mart. Fl. Bras. **2**^{3}: 265. 1883.

A tall, glabrous, sparingly branched perennial, with flat blades and commonly 2 or 3 racemes.

RANGE: Savannas, Central America to Brazil. Originally described from Cumaná, Venezuela.

SPECIMENS FROM BRITISH GUIANA: Wiruni-Ituni Savanna, County Berbice (Cattle-trail Survey), *Abraham* 12. Yawakuri Savanna, County Berbice (Cattle-trail Survey), *Abraham* 176. Kwaimatta, *Jenman* 6182*. Without locality, *Schomburgk* 673.

57. ELYONURUS Humb. & Bonpl.

Spikelets alike, in pairs, one sessile and perfect, the other pedicellate and staminate, both awnless, arranged in a spikelike raceme.

1. **Elyonurus adustus** (Trin.) Ekman, Ark. för Bot. **13** ^{10}: 6. 1913.

Andropogon adustus Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. **2**: 259. 1832.

Andropogon latiflorus Nees; Steud. Syn. Pl. Glum. **1**: 364. 1854.

Elyonurus latiflorus Nees; Hack. in Mart. Fl. Bras. **2**^{3}: 307. 1883.

An erect cespitose perennial, about 1 meter tall, with narrow flat blades 2 to 3 mm. wide and solitary woolly racemes 4 to 6 cm. long.

RANGE: Savannas, Guiana to Brazil, whence originally described.

SPECIMENS FROM BRITISH GUIANA: Wiruni-Ituni Savannas, County Berbice (Cattle-trail Survey), *Abraham* 9. Orealla, *Jenman* 48*.

58. MANISURIS L.

Sessile spikelets perfect, awnless, sunken in hollows in the thickened articulate joints of the rachis, the flat, often rugose, indurate first glume covering the hollow; pedicellate spikelet sterile, the pedicel thickened, appressed or adnate to the rachis joint; racemes solitary.

1. **Manisuris guianensis** Hitchc., sp. nov. FIG. 86.

An erect perennial about 1 meter tall; culms terete, glabrous, rather stiff and wandlike; sheaths glabrous, striate, mostly longer than the internodes, wider

FIG. 86.—*Manisuris guianensis.* From the type specimen.

than the base of the blade, producing on each side a firm shoulder; ligule a short membrane about 0.5 mm. long, minutely ciliate; blades spreading, flat or loosely convolute, glabrous, 15 to 25 cm. long, about 4 mm. wide, narrowed toward the base, strongly nerved on both surfaces; raceme stiffly erect, cylindric, the diameter about that of the culm or slightly greater, as much as 20 cm. long, glabrous, the internodes mostly 5 to 8 mm. long, terete, striate, with the sessile spikelet and sterile pedicel forming a cylinder; sessile spikelet about as long as the internode; first glume oblong-lanceolate, obscurely 3-ridged longitudinally, slightly roughened along the margins with 4 to 8 small lumps; second glume as long as the first, thin and hyaline; sterile lemma a little shorter than the first glume, its palea about two-thirds as long; fertile lemma a little shorter than the second glume, acute, the palea about half as long, obtuse; sterile pedicel falcate, several-nerved, as long as the internode, narrowed at base, leaving an opening between that and the margins of the axis, a similar opening between the first glume and the axis, narrowed at apex; sterile spikelet reduced to a circular rudiment about 1 mm. long, made up of 2 glumes.

Type in the U. S. National Herbarium, no. 1,039,395, collected at Lama Stop-off, near Georgetown, British Guiana, October, 1888, by G. S. Jenman (no. 4530).

The only other specimen seen was collected on the Lama Savanna, April, 1888, by Jenman (no. 6032).

59. ISCHAEMUM L.

Sessile spikelets perfect, awned; pedicellate spikelets perfect but not always fruitful; rachis disjointing; racemes 2 to several, digitate, usually so appressed to each other as to appear like a single spike.

Racemes mostly 2; blades mostly less than 5 mm. wide_____1. **I. ciliare.**
Racemes mostly 3 to 5; blades mostly more than 5 mm. wide__2. **I. guianense.**

1. Ischaemum ciliare Retz. Obs. Bot. **6**: 36 [26]. 1791.

A slender much-branched perennial with creeping rooting bases, the fertile culms 30 to 60 cm. tall; blades flat, mostly less than 10 cm. long and 5 mm. wide; racemes usually 2, 3 to 5 cm. long, green, finally spreading; first glumes broadly winged at the summit.

RANGE: Wet grassland, introduced. A native of southeastern Asia.

SPECIMENS FROM BRITISH GUIANA: Bartica, dike near wharf, *Hitchcock* 17163. Hills Estate, near Bartica, a weed in old field, *Hitchcock* 17189. Wismar, sandy soil, *Hitchcock* 17281. Akyma, wet grassland, *Hitchcock* 17434.

2. Ischaemum guianense Kunth; Hack. in DC. Monogr. Phan. **6**: 235. 1889.

A rather stout perennial as much as 1 meter tall, the blades often more than 10 cm. long and usually more than 5 mm. wide; racemes usually 3 to 5, ascending or appressed, brown; first glume narrowed at the summit, not winged.

RANGE: Open ground, apparently confined to the Guianas. Originally described from French Guiana.

SPECIMENS FROM BRITISH GUIANA: Southeast of Lama Stop-off, dike along canal, *Hitchcock* 16964. Mt. Roraima, "our house," *Im Thurn* 260. Kaieteur Savanna, Potaro River, *Jenman* 844*, Potaro River, *Jenman* 915. Horeabea Savanna, *Jenman* 3746*. Lama Savanna, *Jenman* 5976*.

2a. Ischaemum guianense schomburgkii Hack. in DC. Monogr. Phan. **6**: 236. 1889.

Differs in having narrower scaberulous spikelets. Known only from the single collection cited.

SPECIMEN FROM BRITISH GUIANA: Without locality, *Schomburgk* 769.

60. TRIPSACUM L.

Spikelets unisexual; pistillate spikelets solitary, imbedded in the joints of a thickened cartilaginous articulate rachis, the indurate first glume covering the recess in the rachis, the joints readily separating at maturity; staminate spikelets in pairs at the joints of the continuous upper segment of the same rachis, this falling as a whole after anthesis. Stout perennials.

1. **Tripsacum latifolium** Hitchc. Bot. Gaz. **41**: 294. 1906.

A robust perennial 2 to 3 meters tall, with broad flat blades, 2 to 3 cm. wide, and several spikes in a fascicle.

RANGE: Savannas, Guatemala to Guiana. Originally described from Guatemala.

SPECIMEN FROM BRITISH GUIANA: Orealla, Courantyne River, *Jenman* 217*.

61. COIX L.

Spikelets unisexual; pistillate spikelets 2 or 3 together, 1 fertile and 1 or 2 rudimentary, inclosed in a bony beadlike involucre (morphologically a subtending leaf sheath); staminate spikelets approximate in 3's (the third sometimes obsolete) on a slender rachis forming a short raceme, the rachis protruding from the orifice of the involucre, these ultimate inflorescences borne on the ends of numerous branches. Broad-leaved perennials.

1. **Coix lacryma-jobi** L. Sp. Pl. 972. 1753. JOBS-TEARS.

Freely branching, 1 meter or more tall, the cordate clasping blades 2 to 3 cm. broad, the "beads" 8 to 10 mm. long.

RANGE: Moist ground and waste places, especially near dwellings, throughout tropical America, cultivated as an ornamental and for the ivory or grayish beads; often escaped. Originally described from the East Indies.

SPECIMENS FROM BRITISH GUIANA: Georgetown, Peters Hall, along canal, *Hitchcock* 16668. Demerara River, *Jenman* 4214. Coast region, naturalized, *Jenman* in 1888.

While this paper was in press there were received the two following additional species, one of which is new:

Pariana gleasoni Hitchc., sp. nov.

Plants perennial, the leaves and inflorescence borne on separate culms; sterile culms mostly one or two, 30 to 50 cm. tall, erect, glabrous, naked below, bearing one or two leaves at the summit, the middle internode elongate; sheaths glabrous, the lower short ones bladeless, the middle ones with a reduced blade 5 to 15 mm. long, elongate, the throat mostly without bristles, the upper one or two 4 to 6 cm. long, the throat bearing a few stiff bristles; ligule firm, about 1 mm. long; blades firm and flat, elliptic or oblong-elliptic, 18 to 30 cm. long, 5 to 8 cm. wide, slightly unequal at base, rather abruptly narrowed into a petiole 1 to 3 mm. long, the apex gradually narrowed to a sharp point, glabrous except at the scaberulous tip; fertile culms 1 or 2, about 20 cm. tall, bearing a few short bladeless sheaths at base and 2 longer, somewhat inflated ones above, these with blades reduced to narrow points about 5 mm. long, all glabrous and striate; spike 4 to 7 cm. long, purplish; spikelets in groups of 6 at each joint of the articulate rachis, 5 staminate in the outer whorl and one perfect within, all falling together at maturity, the group about 1 cm. long; rachis joint glabrous, terete, shorter than the group of spikelets, curved out-

ward at base within the circle of spikelets, enlarged above into a circular disk, the base of the group top-shaped, hard and smooth, less than 1 mm. long, with 5 ridges joining the space or sinus between the 5 outer or staminate spikelets, the pedicels of the spikelets broad and flat, about 3 mm. long, short-pilose below, glabrate above, nerved, ciliate, one pair coalesced; glumes decussate on the pedicels standing outside or in front of the lemma, broad at base but narrowed to a sharp point, mostly one-third to one-half as long as the lemma, 1 or 2-nerved, glabrous; lemma elliptic, depressed and flat on the back, glabrous, about 6 mm. long, about 2.5 mm. wide, purplish, bearing 2 faint flexuous anastomosing lines near the acutish apex, incurved at the margins around the palea, 3-nerved, the lateral nerves near the edge; stamens several, the anthers 3 mm. long; fertile spikelets perfect, sessile within the whorl of staminate spikelets and within the curve of the rachis, about 6 mm. long, plump, the glumes, lemma, and palea about the same length; glumes 1-nerved, thin, broad and overlapping, inclosing the floret; lemma and palea firm, the lemma 3-nerved, the palea 2-nerved, about as broad as the lemma; the terminal spikelet perfect, solitary, sessile, the glumes 3 to 5-nerved, acuminate, about 7 mm. long, the lemma firm. shorter than the glumes.

Type in the U. S. National Herbarium, no. 1,064,516, collected in dense upland bush at Potaro Landing, British Guiana, June 25 to 27, 1921, by H. A. Gleason (no. 209).

This species is distinguished by the large blades, single or two approximate at the summit of the sterile culms, and by the details of the inflorescence. The staminate spikelets appear to be in a whorl of 5, rather than in opposite groups.

Like other species of the genus this grows here and there, in the rich virgin forest, rarely more than one specimen in flower at one place. Only known from specimens collected in British Guiana by Dr. Gleason, the three besides the type being Potaro Landing, *Gleason* 249; Tumatumari, *Gleason* 312, 348.

Chaetochloa poiretiana (Schult.) Hitchc. Contr. U. S. Nat. Herb. **22**: 159. 1920.

Panicum poiretianum Schult. Mant. **2**: 229. 1824.

Panicum sulcatum Bertol. Excerp. 14. 1820. Not *Panicum sulcatum* Aubl.

Culms 1 to 1.5 meters tall; blades plicate, as much as 1 meter long and 10 cm. wide; panicle narrow, erect, as much as 60 cm. long.

Santa Rosa, Pomeroon District, *J. S. De La Cruz* 994. Central Mexico to Argentina. Called gamalote in Trinidad.

LIST OF NEW SPECIES AND NEW NAMES.

	Page.
Eragrostis guianensis Hitchc., sp. nov	454
Triodia flaccida (Doell) Hitchc	457
Uralepis flaccida **Doell.**	
Syntherisma malacophylla Hitchc., sp. nov	466
Syntherisma cuyabensis (Trin.) Hitchc	468
Panicum cuyabense **Trin.**	
Syntherisma chinensis (Nees) Hitchc	468
Paspalum chinense **Nees.**	
Axonopus leptostachyus (Flügge) Hitchc	471
Paspalum leptostachyum **Flügge.**	
Axonopus scoparius (Flügge) Hitchc	471
Paspalum scoparium Flügge.	
Axonopus attenuatus (Presl) Hitchc	471
Paspalum attenuatum **Presl.**	
Axonopus stragulus Chase, sp. nov	472
Paspalum orbiculatum potarense Chase, subsp. nov	478
Paspalum abrahami Chase, sp. nov	480
Panicum luticola Hitchc., sp. nov	485
Panicum guianense Hitchc., sp. nov	487
Panicum asperifolium (Desv.) Hitchc	489
Streptostachis asperifolia **Desv.**	
Panicum magnum Hitchc., sp. nov	489
Panicum errabundum Hitchc., sp. nov	494
Raddia malmeana (Ekman) Hitchc	505
Olyra malmeana **Ekman.**	
Manisuris guianensis Hitchc., sp. nov	510
Pariana gleasoni Hitchc., sp. nov	513
	515

INDEX.

[Synonyms in *italic*.]

	Page.
Acroceras oryzoides	491
Agrostis indica	462
radiata	461
virginica	462
Aira laxa	456
Anastrophus compressus	472
Anatherum	508
spathiflorum	507
zizanioides	508
Andropogon	506
adustus	510
annulatus	507
bicornis	507
bracteatus	508
contortus	510
hispidus	464
insularis	465
ischaemum	507
latiflorus	510
leucostachyus	508
selloanus	508
muricatus	508
nodosus	507
panormitanus	506
pertusus panormitanus	506
plumosus	510
polydactylon	461
secundus	510
selloanus	508
sorghum sudanensis	509
spathiflorus	507
virgatus	507
Anthaenantia lanata	464
Aristida	462
americana	461
capillacea	462
elegans	462
Arundinaria	452
deflexa	452
Arundinella	464
brasiliensis	464
hispida	464
Arundo	456
donax	456
nitida	457
roraimensis	457
saccharoides	456
Axonopus	470
attenuatus	471
aureus	471
capillaris	471
compressus	472
leptostachyus	471
Axonopus scoparius	471
stragulus	472
Bahama grass	460
Bamboo, common	453
Bambos vulgaris	453
Bambusa guadua	452
Barbados sourgrass	506
Bermuda grass	460
Bouteloua	461
americana	461
elatior	461
litigiosa	461
Cabrera, section	470
Capriola	459
dactylon	460
Carpet grass	472
Cenchrus	503
dactylolepis	503
echinatus	503
inflexus	469
marginalis	469
viridis	503
Chaetochloa	501
geniculata	502
tenax	502
Chloris	460
foliosa	460
polydactyla	461
radiata	461
Chusquea	452
linearis	452
Coix	513
lacryma-jobi	513
Cortaderia	457
argentea	446
nitida	457
roraimensis	457
Crabgrass	466
Cymbopogon	508
bracteatus	508
Cynodon	459
dactylon	460
Cynosurus aegyptius	459
domingensis	459
indicus	459
virgatus	458
Dactyloctenium	459
aegyptiacum	459
aegyptium	459
Dichanthium nodosum	507
Digitaria	465
fimbriata	466
horizontalis	466

	Page.
Digitaria longiflora	468
marginata	466
sanguinalis	466
setigera	466
setosa	466
Echinochloa	501
colonum	501
crusgalli crus-pavonis	501
polystachya	501
Echinolaena	469
hirta	469
inflexa	469
polystachya	469
scabra	469
Eleusine	459
filiformis	458
indica	459
mucronata	458
Elyonurus	510
adustus	510
latiflorus	510
Eragrostis	453
amabilis	453
amoena	454
ciliaris	453
delicatula	454
guianensis	454
maypurensis	454
panamensis	454
pilosa	454
plumosa	453
tephrosanthos	454
vahlii	454
Eriochloa	469
annulata	470
punctata	470
ramosa	470
subglabra	470
Eriochrysis	509
cayennensis	509
Festuca filiformis	458
Giant reed	456
Goose grass	459
Guadua	452
angustifolia	452
glomerata	452
Guinea grass	484
Gymnopogon	460
foliosus	460
Gynerium	456
saccharoides	456
sagittatum	456
Heteropogon	509
contortus	510
Holcus	509
sorghum	509
sudanensis	509
striatus	498
Homalocenchrus	463
hexandrus	463
Homolepis	499
isocalycia	500
Hymenachne	499
amplexicaulis	499
auriculata	499

	Page.
Hymenachne *myuros*	499
striata	498
Ichnanthus	496
axillaris	497
ichnodes	496
pallens	497
panicoides	496
riedelii	496
Imperata	505
brasiliensis	505
caudata	506
contracta	506
Isachne	500
polygonoides	500
trachysperma	500
Ischaemum	512
ciliare	512
guianense	512
schomburgkii	512
hispidum	464
secundatum	468
Jobs-tears	513
Khuskhus	508
Lasiacis	497
ligulata	498
procerrima	498
sorgholdea	498
Leersia	463
hexandra	463
Leptochloa	458
domingensis	459
filiformis	458
mucronata	458
perennis	458
scabra	458
virgata	458
domingensis	459
gracilis	459
Leptocoryphium	464
lanatum	464
Leptostachys domingensis	459
filiformis	458
virgata	458
Luziola	463
spruceana	463
Manisuris	510
guianensis	510
Megastachya amoena	454
panamensis	454
Milium compressum	472
digitatum	466
punctatum	470
ramosum	470
Monachne subglabra	470
Nastus guadua	452
Olyra	503
arundinacea	504
caudata	504
cordifolia	504
latifolia	504
malmeana	505
micrantha	504
nana	505
paniculata	504
surinamensis	503

	Page.
Oplismenus	500
burmanni	500
crus-pavonis	501
hirtellus	500
polystachyus	501
Orthoclada	456
laxa	456
rariflora	456
Oryza	463
sativa	463
Pampas-grass	446
Panicum	480
altissimum	492
altum	493
amplexicaule	499
asperifolium	489
auriculatum	499
axillare	497
balanites	489
barbinode	484
brasiliense	494
caespitosum	483
chnoodes	492
chrysites	471
colonum	501
commelinaefolium	494
cuyabense	468
cyanescens	494
dactylon	460
echinolaena	469
elephantipes	492
eligulatum	492
errabundum	494
frondescens	485
geminatum	484
geniculatum	502
gibbum	498
glutinosum	493
grossarium	483
guianense	487
helobium	494
hirsutum	493
hirtellum	500
ichnodes	496
imberbe	502
impressum	502
insulare	465
isocalycium	500
jumentorum	484
lanatum	465, 498
laxum	487
leucophaeum	465
luticola	485
magnum	489
maximum	484
megiston	492
micranthum	493
milleflorum	489
millegrana	491
molle	484
myosurus	499
myuros	499
nervosum	494
olyroides	492
oryzoides	491
pallens	497

	Page.
Panicum parvifolium	494
paspalodes	485
pilcomayense	493
pilisparsum	489
pilosissimum	492
pilosum	489
polycomum	493
polygamum	484
polygonatum	487
polygonoides	500
procerrimum	498
prostratum	483
rariflorum	456
reptans	483
riedelii	496
rudgei	492
ruguloseum	491
sabulicola	501
sanguinalis	466
sorghoideum	498
spectabile	501
stenodes	491
stoloniferum	485
streptostachys	489
striatum	498
tenax	502
tenuiculme	487
trichoides	485
uncinatum	469
velutinosum	484
zizanioides	491
Pará grass	484
Pariana	457
gleasoni	513
radiciflora	457
zingiberina	458
Paspalum	474
abrahami	480
appressum	484
arenarium	479
attenuatum	471
capillare	471
carinatum	475
chinensis	468
compressum	472
conjugatum	476
coryphaeum	480
decumbens	477
densum	479
distichum	476
vaginatum	476
exasperatum	471
fimbriatum	475
fluitans	475
gracile	475
lanatum	464
leptostachyum	471
longiflorum	468
melanospermum	478
millegrana	479
minutiflorum	468
multicaule	476
nutans	477
olivaceum	478
orbiculatum	478
potarense	478

	Page.
Paspalum paniculatum	497
papillosum	476
pectinatum	475
pedunculatum	477
platicaulon	472
parviflorum	474
pulchellum	477
pumilum	477
pusillum	478
repens	475
scoparium	471
serpentinum	477
vaginatum	476
virgatum	479
Pennisetum	502
setosum	502
Phalaris zizanioides	508
Pharus	463
latifolius	464
Poa amabilis	453
ciliaris	453
maypurensis	454
pilosa	454
plumosa	453
vahlii	454
Pseudechinolaena	469
polystachya	469
Raddia	505
malmeana	505
nana	505
Reimaria laxa	465
Rice	463
Saccharum contractum	506
officinarum	506
sagittatum	456
Sacciolepis	498
myuros	499
striata	498
St. Augustine grass	469
Sandbur	503
Setaria	501
biconvexa	502
onurus	502
purpurascens	502
Sheep grass	469
Sorghum	509
Sorgo	509
Sourgrass	476
Spartina	460
brasiliensis	460
Sporobolus	461
aeneus	462
ciliatus	462
cubensis	462
indicus	462
jacquemontii	462
virginicus	462
Stenotaphrum	468
americanum	468
glabrum americanum	468
secundatum	468
Streptostachis asperifolia	489
hirsuta	489
Sudan grass	509
Sugar cane	506
Syntherisma	465
chinensis	468
cuyabensis	468
digitata	466
helleri	468
longiflora	468
malacophylla	466
sanguinalis	466
Thysanolaena acarifera	446
agrostis	446
Tiger grass	446
Trachypogon	510
plumosus	510
polymorphus plumosus	510
Trichachne insularis	465
recalva	465
Tricholaena insularis	465
Triodia	457
flaccida	457
Tripsacum	513
latifolium	513
Uralepis flaccida	457
Uva grass	456
Valota	464
insularis	465
laxa	465
Vetiveria arundinacea	508
Vilfa aenea	462

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THE NORTH AMERICAN SPECIES OF ARISTIDA

By A. S. HITCHCOCK

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PREFACE.

In the accompanying paper A. S. Hitchcock, systematic agrostologist of the United States Department of Agriculture, has presented a revision of *Aristida*, one of the larger genera of North American grasses. The species of *Aristida*, or needlegrasses, are found throughout the temperate and tropical regions of the world in grassy plains and hills, and are often the dominant species of prairies, steppes, deserts, and arid or semiarid lands generally. They are also frequent in the pine barrens of the Coastal Plain of the United States. In the early stages of their growth they form a significant part of the forage in regions where they grow, but when they mature they become hard and wiry. On the grazing areas where needlegrasses are common, the sharp-pointed fruits are troublesome to stock, because they often penetrate the skin and sometimes also the eyes and nostrils.

The genus itself is easily identified by the hard, cylindrical, three-awned, sharp-pointed fruits, but the species are closely allied and often can be distinguished only with difficulty. There are 60 species in North America, 7 of which are here described as new.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

CONTENTS.

	Page.
Introduction	517
Description of the genus and species	518
Doubtful species	585
List of new species and new names	586
Excluded species	586
Index	VII

THE NORTH AMERICAN SPECIES OF ARISTIDA.

By A. S. Hitchcock.

INTRODUCTION.

The genus *Aristida*, one of the large genera of grasses, belongs to the tribe Agrostideae, and together with *Stipa* and *Oryzopsis* comprises the group Stipeae, distinguished by the hard sharp-pointed fruits with the terete lemma convolute around the palea.

The genus is well distributed over the tropical and temperate parts of the world, but mostly on plains, prairies, and open ground. In general, the species are erect bunch grasses with hard wiry culms and blades.

The awns and the sharp, barbed callus aid in dissemination. This needle-like callus or barbed point of the fruit permits it to penetrate clothing or the fur of animals and be transported. In such species as *Aristida longiseta*, of our western plains, the long divergent awns are a distinct aid in transportation by the wind. The fruits are driven through the air, the sharp callus forward, and accumulate in large masses along fences and other obstructions. In the species mentioned, the awns may be as much as 8 cm. long. In *A. pallens*, of Argentina, the awns are as much as 15 cm. long. In *A. plumosa*, of Persia and North Africa, the central awn is 5 to 8 cm. long, the upper two-thirds being beautifully feathery.

The species of *Aristida* constitute a considerable proportion of the grass flora of the plains and deserts of the Southwestern States and northern Mexico and not infrequently may be the dominant species of grass. In the early stages of their growth before the fruits have developed they are relished by stock, but after the maturity of the fruit they are too dry and hard for forage and often become troublesome because of the pestiferous fruits.

In spite of their abundance, the species of *Aristida* have received no very distinctive common names. They are sometimes called spear grasses, needlegrasses, and triple-awned grasses; the first two names are applied also to species of *Stipa*. Certain species of the group Purpureae, especially *Aristida longiseta*, are called dog-town grass because of the tendency to establish themselves in the new soil thrown

up by prairie dogs. It seems best to apply the name needlegrasses to the species of *Aristida* and leave the name spear grasses for the species of *Stipa*.

The North American species mostly belong to the section *Chaetaria*, in which the awns are all developed and are not articulate with the lemma. A few species belong to the section *Arthratherum*, in which the column is articulate with the lemma, and a few belong to the section *Uniseta*, in which the lateral awns are wanting or minute. A fourth section, *Stipagrostis*, in which the column is articulate with the lemma and the awns are plumose, is not represented within our range.

DESCRIPTION OF THE GENUS AND SPECIES.

ARISTIDA L.

Aristida L. Sp. Pl. 82. 1753. The only species given is *A. adscensionis*, which therefore is the type. Linnaeus states that this species is one of four collected on the island of Adscension [Ascension], the others being *Sherardia fruticosa*, *Euphorbia origanoides*, and *Portulaca*. The type specimen of *Aristida adscensionis* is in the Linnaean Herbarium.

Arthratherum Beauv. Ess. Agrost. 32, 152. 1812. See under section *Arthratherum*.

Chaetaria Beauv. Ess. Agrost. 30, 158. 1812. See under section *Chaetaria*.

Curtopogon Beauv. Ess. Agrost. 32, 159. 1812. See under section *Chaetaria*.

Streptachne R. Br. misapplied by H. B. K. Nov. Gen. & Sp. 1: 124. 1816. See under section *Uniseta*.

Stipagrostis Nees, Linnaea 7: 290. 1832. The only species described is *S. capensis* Nees. This group constitutes a section of *Aristida* not represented in North America.

Schistachne Fig. & De Not. Mem. Accad. Torin. II. 12: 252. 1852. The type is *Aristida ciliata* Desf. The group should be referred to section *Stipagrostis*.

DESCRIPTION.

Glumes narrow, acuminate or awned, equal or unequal, 1-nerved or the first sometimes with a second nerve on one side, rarely 3 or 5-nerved, the first usually scabrous on the keel, sometimes also on the back, the second glabrous, the awn terminal or sometimes from a slight notch; lemma at maturity indurate, terete or somewhat compressed, convolute around the palea, disarticulating at base and bearing a pointed barbed callus as much as 2 mm. long (rarely 4 mm.), the body glabrous or sometimes scabrous on the upper half or toward the tip, often narrowed above and passing into the base of the awns; awns 3, united at base, the basal portion or column sometimes elongate and sometimes twisted, rarely articulate with the body, the lateral awns sometimes reduced or wanting, the central awn sometimes coiled at base in a spiral, all the awns sometimes contorted at base in a loose partial spiral, ascending or reflexed, sometimes the central awn reflexed by a semicircular bend.

Annual or perennial grasses with narrow flat or involute blades, very short ligules (ciliolate and usually not over 0.5 mm. long) and narrow or open panicles.

KEY TO THE SECTIONS.

Lemma articulate with the column of the awns; awns nearly equal.
SECTION **Arthratherum** (p. 519)

Lemma not articulate.
Lateral awns minute (less than 1 mm. long) or wanting. (See also *A. dichotoma* and *A. ramosissima* of section *Chaetaria*).
SECTION **Uniseta** (p. 523)
Lateral awns more than 1 mm. long (rarely obsolete in *A. ramosissima*). usually well developed---------- SECTION **Chaetaria** (p. 529)

SECTION **Arthratherum** (Beauv.) Reichenb. Consp. Reg. Veg. 50. 1828.

Arthratherum Beauv. Ess. Agrost. 32, 152. *pl. 8. f. 8, 9.* 1812. *Arthraterum* Roem. & Schult. Syst. Veg. 2: 398. 1817. The type species is *Aristida hygrometrica* R. Br., the first one figured. Beauvois mentions two others, *A. stipoides* R. Br. and *A. pungens* Desf.

Lemma articulate with the column of the awns, the latter finally deciduous, not plumose; glumes 1-nerved; awns nearly equal. Species of this section are found also in Asia, Africa, and Australia.

KEY TO THE SPECIES.

Plants annual.
Culms glabrous; awns arcuate-contorted at base.
Column very short---------- 1. **A. desmantha.**
Column 10 to 15 mm. long, twisted---------- 2. **A. tuberculosa.**
Culms pubescent; awns divergent but not arcuate-contorted at base.
3. **A. peninsularis.**

Plants perennial.
Culms pubescent---------- 4. **A. californica.**
Culms glabrous---------- 5. **A. glabrata.**

1. **Aristida desmantha** Trin. & Rupr.

Aristida desmantha Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 109. 1842. "Texas (*Drummond* n. 285)." Trinius and Ruprecht state that no. 333 in the Vienna Herbarium is the same. The type has been examined in the Trinius Herbarium at Petrograd.

DESCRIPTION.

Plants annual; culms erect, branching, smooth, as much as 80 cm. tall; sheaths glabrous, or the lower villous or appressed hispid, villous on the margin and at the throat; blades folded or involute, glabrous beneath or scabrous toward the upper end, scabrous and striate-nerved on the upper surface, scabrous on the margins, as much as 20 cm. long, 2 to 3 mm. wide, tapering to a fine point; panicle usually long-exserted, as much as 20 cm. long, the branches stiffly ascending, very scabrous, mostly in pairs of unequal length, rather distant, the lower as much as 8 cm. long, bearing 1 to few spikelets toward the summit; spikelets brownish or yellowish, the pedicles 1 to 10 mm. long; glumes slightly unequal, the body about 1 cm. long, tapering into an awn about half as long, the first scabrous on the keel; lemma 7 to 8 mm. long, glabrous below, somewhat laterally compressed and slightly twisted at summit, the densely pubescent callus about 2 mm. long; awns scabrous, 2 to 2.5 cm. long, united for 1 to 2 mm., the bases curved in a semicircular somewhat contorted bend, the upper part thus usually deflexed.

DISTRIBUTION.

Open sandy soil or sandy woods, Illinois to Texas.

ILLINOIS: Mason County, *Bebb* in 1861. Without locality, *Vasey*.
TEXAS: Dallas, *Reverchon* 1057, 3479, 4202, 3428* (in *Curtiss*, N. Amer. Pl.). Without locality, *Wright; Drummond* 285, 333.

2. Aristida tuberculosa Nutt.

Aristida tuberculosa Nutt. Gen. Pl. 1: 57. 1818. "In the sandy pine forests of Georgia a few miles from Augusta."

Chaetaria tuberculosa Schult. Mant. 2: 211. 1824. Based on *Aristida tuberculosa* Nutt.

DESCRIPTION.

Plants annual; culms erect, branching, smooth, 30 to 60 cm. or even as much as 1 meter tall; sheaths glabrous, sparsely villous at the throat or the lowermost sparsely villous throughout; ligule a ciliate membrane about 1 mm. long; blades involute, glabrous beneath except toward the tip, strongly nerved and scabrous on the upper surface, scabrous on the margin, 10 to 20 cm. long, 2 to 4 mm. wide, more or less flexuous; panicles mostly 10 to 20 cm. long, the branches stiffly ascending, very scabrous, rather distant, mostly in pairs, the longer one naked at base, bearing a few spikelets on the upper half, the shorter one branching near the base and bearing usually two spikelets; spikelets pale or dark brown, the shorter pedicels 3 to 5 mm. long; glumes about equal, glabrous on the back, the first scabrous on the keel, gradually narrowed into an awn, about 2.5 cm. long including the awn; fertile lemma 11 to 13 mm. long, glabrous except for the slightly scabrous summit, extending downward into a densely pubescent callus 3 to 4 mm. long; column of awns twisted, scabrous, 10 to 15 mm. long, the upper 2 to 3 mm., twisted but not united, above this forming a semicircular bend, the terminal straight part of the awns usually deflexed, 3 to 4 cm. long.

DISTRIBUTION.

Open sandy fields, Massachusetts to Georgia and Mississippi, near the coast; also around the southern end of Lake Michigan and in other localities in Wisconsin and Illinois, and in Mexico.

MASSACHUSETTS: Essex County, *Conant* in 1878.
CONNECTICUT: Bridgeport, *Winton* in 1880. Fairfield Beach, *Eames* in 1895.
NEW YORK: Lake Grove, Long Island, *Hallock* in 1879. Seldon, Long Island, *Miller* in 1872. Coney Island, *Brinton* in 1880. Crookes Point, Staten Island, *Wilson* in 1915. New Dorp, Staten Island, *Kearney in* 1894; *Tyler* in 1895.
NEW JERSEY: Forked River, *Chase* 3592.
INDIANA: Tolleston, *V. H. Chase* 322. Millers, *Umbach* in 1897; *Umbach* in *Kneuck. Gram. Exs.* 742; *Chase* 507, 633. Dune Park, *Chase* 2077.
ILLINOIS: Cobden, *Waite* in 1884. Mason County, *Hall* in 1860. Oquawka, *Patterson* in 1874.
WISCONSIN: North Bend, *Pammel* in 1886.
MINNESOTA: Winona, *Holzinger* 18 (Gray Herb.).
DELAWARE: Sussex County, *Canby* (Gray Herb.).
VIRGINIA: Chincoteague Island, *Canby* in 1878.
SOUTH CAROLINA: Aiken, *Ravenel* in 1869.
GEORGIA: Chattahoochee County, *Harper* 1794.

KENTUCKY: Without locality, *Short* (Gray Herb.).
MISSISSIPPI: Cat Island, *Tracy* 1579. Horn Island, *Tracy* 1579.
NUEVO LEÓN: Monterrey, *Abbon* in 1912.
PUEBLA: Puebla, *Nicolás* in 1908.
MICHOACÁN: Morelia, *Nicolás* in 1909.

3. Aristida peninsularis Hitchc., sp. nov.

DESCRIPTION.

Plants annual, bushy-branched; culms slender, ascending, branching, pubescent, 10 to 20 cm. tall; sheaths glabrous, pubescent at the throat and slightly so on the collar; blades flat or somewhat involute, glabrous beneath, puberulent on the upper surface, nerved, 1 to 3 cm. long; panicles very numerous, mostly 1 to 3-flowered; glumes unequal, 1-nerved, glabrous or the keel of the first slightly scabrous toward tip, the first about 1 cm. long, acute, the second about 2 cm. long, narrowed into a slender tip but not awned; lemma about 8 mm. long, glabrous below, minutely scaberulous toward the summit, the callus densely pubescent, about 2 mm. long; column about 2 cm. long, twisted, the 3 awns about equal, 4 to 5 cm. long, diverging but not arcuate-contorted at base.

Type in the U. S. National Herbarium, no. 745524, collected on sandy beaches at Los Angeles Bay, Lower California, Mexico, November, 1887, by Edward Palmer (no. 501).

This species differs from *A. californica* in being an annual, and in its larger glumes, lemma, and awns.

This collection was included in Watson's list of Palmer's plants from Guaymas and vicinity[1] as *Aristida fugitiva* Vasey, a nomen nudum. Doctor Vasey wrote upon one of the sheets of this collection "*Aristida fugitiva* n. sp.," which he later changed to "*A. californica* var. *fugitiva* V." When the latter name was published[2] the only specimen mentioned was from "Colorado Desert (C. R. Orcutt)," which must be accepted as the type. The Orcutt specimen is *A. californica* and is not the same as the Palmer collection which is the only one known of this species.

4. Aristida californica Thurb.

Aristida californica Thurb.; S. Wats. Bot. Calif. **2**: 289. 1880. "Colorado Desert (*Schott*); Fort Mohave, *Cooper*." The name, without description, was included earlier in a list of California grasses[3] with the note "Collected by Professor Brewer," but without locality. The specimen collected by Dr. Cooper is in the U. S. National Herbarium.

Aristida jonesii Vasey, Contr. U. S. Nat. Herb. **3**: 48. 1892, as a synonym of *A. californica*. The specimen so named by Vasey was collected at The Needles, California, by M. E. Jones in 1884 (no. 68a).

Aristida californica var. *fugitiva* Vasey, Contr. U. S. Nat. Herb. **3**: 49. 1892. "Colorado Desert (*C. R. Orcutt*)." The name appeared earlier in a list of plants collected by Palmer in northwestern Mexico,[4] but was there applied to a different plant.

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[1] Proc. Amer. Acad. **24**: 80. 1889.
[2] Contr. U. S. Nat. Herb. **3**: 49. 1892. See note under *A. californica*.
[3] Bolander, Grasses of the State. Trans. Agr. Soc. Calif. **1864–5**: 134. 1866.
[4] See notes under *A. peninsularis*.

DESCRIPTION.

Plants tufted, much branched at base, apparently perennial; culms branched, slender, pubescent, 10 to 30 cm. tall; sheaths glabrous or puberulent, pubescent at the throat and on the collar; blades mostly involute, scabrous beneath, puberulent on the upper surface, nerved, mostly less than 5 cm. long; panicles numerous, mostly few-flowered racemes; glumes unequal, 1-nerved, the first about 8 mm. long and about two-thirds as long as the second, 1-nerved, acutish, the second narrowed into a slender point but scarcely awned; lemma 5 to 7 mm. long, glabrous below, scaberulous toward the summit, the strongly pubescent callus 1.5 to 2 mm. long, the mature fruit mottled; column 15 to 20 mm. long, terete and very scabrous below, twisted and less scabrous above, the free ends of the awns about equal, 2.5 to 3.5 cm. long, spreading horizontally or somewhat ascending, the bases arcuate and slightly contorted.

DISTRIBUTION.

Dry sandy or gravelly soil, southern California and northwestern Mexico.

CALIFORNIA: Fort Mohave, *Cooper* 2217. Baxter Sink, Mohave River, *Parish* 9886. Palmita Springs, Colorado Desert, *Orcutt* in 1890. Borregos Springs, *Brandegee* 106 in 1894. The Needles, *Jones* in 1884. Travertine Peak, Salton Basin, *Parish* 8238.

SONORA: MacDougal Pass, Pinacate Mountains, *MacDougal* 32 in 1907.

LOWER CALIFORNIA: Lagoon Head, *Palmer* 654 in 1889; *Orcutt* in 1899. Socorro, *Orcutt* 1443, 1444. Calmallf, *Orcutt* in 1899; *Purpus* 63 in 1898.

5. **Aristida glabrata** (Vasey) Hitchc.

Aristida californica var. *major* Vasey, Proc. Calif. Acad. II. **2**: 212. 1889, name only. The specimen was collected by T. S. Brandegee on Magdalena Island in 1889. It is about 60 cm. tall.

Aristida californica var. *glabrata* Vasey, Proc. Calif. Acad. II. **3**: 178. 1891. "San José del Cabo, Todos Santos," Lower California. Collected by T. S. Brandegee.

DESCRIPTION.

Plant perennial; culms erect, branching, glabrous, 20 to 40 cm. tall; sheaths glabrous, the collar and throat glabrous; blades mostly involute, scaberulous beneath, puberulent on the upper surface, those of the culm mostly 1 to 3 cm. long; panicles narrow, 3 to 6 cm. long, few to several flowered, the spikelets single or in pairs; spikelets appressed, the pedicels 1 to 3 mm. long; glumes unequal, 1 nerved, smooth except the first slightly scabrous on the keel above, the first acute, 5 to 6 mm. long, the second narrowed into a slender point, not awned, 10 to 12 mm. long; fertile lemma mottled at maturity, 5 to 7 mm. long, scaberulous toward summit, the callus densely pubescent, about 1.5 mm. long, the slender twisted scabrous column, 6 to 14 mm. long; awns about equal, diverging, 2 to 3 cm. long.

This species differs from *A. californica* in the glabrous culms, the shorter column, and the longer, more densely flowered panicles.

DISTRIBUTION.

Open dry ground, Arizona and Lower California.

ARIZONA: Santa Rita Mountains, *Griffiths & Thornber* 197; *Griffiths* 3917, 4372, 4783, 5965, 6229, 6954, 6998, 6999, 7276; *Thornber* 69; *Wooton* in 1911, 1912, and 1914. Desert Wells, *Griffiths* 7312. Yucca, *Jones* 3895. Phoenix, *Hitchcock* 13665. Sasabey, *Griffiths* 6931.

LOWER CALIFORNIA: San José del Cabo, *Brandegee* 34 in 1890, 5 in 1889, 38 in 1893, 311 in 1901; *Rose* 16505. La Paz, *Palmer* 129 in 1890. Lagoon Head, *Palmer* 654 in 1889. Magdalena Island, *Orcutt* 41 in 1917.

SECTION Uniseta Hitchc.

Humboldt, Bonpland, and Kunth (Nov. Gen. & Sp. 1: 124. 1816) misapplied the name *Streptachne* R. Br. (1810) to this group, describing three species, *S. scabra*, *S. pilosa*, and *S. tenuis*. *Streptachne* R. Br. was based on *S. stipoides*, which belongs to a distinct genus.

Nees (in Seem. Bot. Voy. Herald 225. 1857) used *Ortachne* in this sense, including one species, *O. pilosa* (*Aristida jorullensis*), but the name had been used earlier by Nees,[5] for a different genus, based upon *O. retorta* Nees. The original specimens of *Streptachne* and *Ortachne* have been studied by Miss Hughes. (For discussion see Bull. Misc. Inf. Kew 1923: 301. 1923.)

KEY TO THE SPECIES.

Awn (column) twisted at base ..... 7. A. schiedeana.
Awn not twisted.
  Plants annual; axils and branchlets beset with a few long hairs; awn flexuous ..... 8. A. jorullensis.
  Plants perennial; axils and branchlets devoid of long hairs; awn curved but not flexuous.
    Awn more or less arcuate but not horizontally bowed; panicle open. the branches long and naked below (shorter in var. *divergens*); lateral awns mostly obsolete ..... 6. A. ternipes.
    Awn curved in a semicircular bend, the terminal part horizontal or deflexed; panicle narrow, the short branches spikelet-bearing from the base or nearly so; lateral awns present, less than 1 mm. long.
      Sheaths pilose at throat; first glume 6 mm., the second 8 mm. long. 9. A. purpusiana.
      Sheaths glabrous at throat; first glume 12 mm. long, the second a little shorter ..... 10. A. geminiflora.

6. Aristida ternipes Cav.

Aristida ternipes Cav. Icon. Pl. 5: 46. 1799. "Habitat Panamaide, inventa A Domino Ludovico Nee." The type specimen is in the herbarium of the Botanical Garden at Madrid and a fragment of the inflorescence in the U. S. National Herbarium. The lateral awns are described as short; in the specimen they are minute, less than 1 mm. long.

Streptachne scabra H. B. K. Nov. Gen. & Sp. 1: 124. *pl. 40.* 1816. "Crescit in frigidis, montanis regni Mexicani juxta Tolucca et Islahuaca." The type has been examined at Paris.

Aristida scabra Kunth, Rév. Gram. 1: 62. 1829. Based on *Streptachne scabra* H. B. K.

Muhlenbergia scabra Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 183. 1842. Based on *Aristida scabra* Kunth.

Streptachne cubensis A. Rich. in Sagra, Hist. Cuba 11: 311. 1850. "Crescit in locis aridis et saxosis insulæ Cubæ, prope Cabaña et alibi (Ramon de la Sagra)." A fragment from the type specimen in the herbarium of the Museum at Paris has been kindly sent by the Director, M. Lecomte.

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[5] Steud. Syn. Pl. Glum. 1: 121. 1854.

Streptachne floridana Chapm. Fl. South. U. S. 554. 1860. "South Florida, *Dr. Blodgett.*" The type specimen is from Key West. This differs from the usual form of *Aristida ternipes* in having a condensed panicle, the ascending branches 3 to 5 cm. long, floriferous nearly to base, and in having more curved and flexuous awns, the point or column of the fruit being somewhat twisted as well as curved. No other specimens have been observed that are like the type collection in these respects.

Aristida floridana Vasey, Descr. Cat. Grasses U. S. 35. 1885. Based on *Streptachne floridana* Chapm.

Ortachne scabra Fourn. Mex. Pl. 2: 80. 1886. Based on *Streptachne scabra* H. B. K.

Ortachne floridana Nash in Small, Fl. Southeast. U. S. 119. 1903. Based on *Streptachne floridana* Chapm.

DESCRIPTION.

Plants perennial; culms erect, firm, several in a tuft, glabrous, mostly 50 to 100 cm. tall; sheaths glabrous or scabrous toward the summit, slightly villous or glabrate at the throat; blades flat, involute above and tapering into a fine involute point, as much as 40 cm. long, 2 to 3 mm. wide, narrower than the summit of the sheath, scabrous or glabrous beneath, scabrous or scabrous-pubescent on the upper surface, more or less villous at base and sometimes sparsely so above the base; panicle open, nodding at summit, one-third to half the entire length of the culm, the branches few, distant, spreading, scabrous, solitary or fascicled, often in threes, mostly naked at base; spikelets appressed at the ends of the branches; glumes about equal, acuminate, 1-nerved or obscurely 3-nerved, 8 to 10 mm. long, the first scabrous on the keel; lemma glabrous, the keel often strongly scabrous, gradually narrowed into a laterally compressed scabrous falcate beak 1-nerved on each side, this extending into the single arcuate scabrous nearly terete awn, the callus pilose with hairs as much as 2 mm. long, the lemma to the obsolete or minute lateral awns about 17 mm. (7 to 30 mm.) long, the central awn 10 to 15 mm. (7 to 20 mm.) long.

The spikelets vary in size, those of Palmer's no. 161 from Chihauhua being smaller than the average, while those of Rose's no. 3694 are unusually large, as much as 3 cm. to the lateral awns. In other respects these plants do not appear to differ.

DISTRIBUTION.

Rocky hills and dry plateaus, Arizona to northern South America; also in the Bahamas, Cuba, and southern Florida.

FLORIDA: Key West, *Blodgett.*

NEW MEXICO: Organ Mountains, *Wooton* in 1895; *G. R. Vasey* in 1881.

ARIZONA: Chiricahua Mountains, *Blumer* in 1907; *Toumey* in 1896. Santa Rita Forest Reserve, *Griffiths* 5961, 7271; *Griffiths & Thornber* 44; *Wooton* in 1911, 1912, 1914. Fort Huachuca, *Wilcox* 2548 and in 1894. Patagonia, *Hitchcock* 3653. San Luis Mountains, *Mearns* 2107. Clear Creek, *MacDougal* 625. Santa Catalina Mountains, *Griffiths* 7060. Tucson, *Hitchcock* 13251. Celero Mountains, *Griffiths* 6130. Without locality, *Lemmon* in 1882.

LOWER CALIFORNIA: San José del Cabo, *Brandegee* 36 in 1890. Benorama, *Brandegee* in 1899.

SONORA: Hermosillo, *Hitchcock* 3537, 3596, 3603. Álamos, *Palmer* 702 in 1890. Guaymas, *Palmer* 55 and 268 in 1887; *Hitchcock* 3545; *Rose, Standley & Russell* 12607.

CHIHUAHUA: Chihuahua, *Pringle* 387; *Hitchcock* 7789. Batopilas, southwestern Chihuahua, *Palmer* 115 and 161 in 1885.
TAMAULIPAS: Between Victoria and Río Blanco, *Karwinsky* in 1842.
SAN LUIS POTOSÍ: Las Palmas, *Pringle* 3776.
DURANGO: Santiago Papasquiaro, *Palmer* 472 in 1896.
SINALOA: Chilillo, *Dehesa* 1590. Lodiego, *Palmer* 1653 in 1891. Culiacán, *Rose, Standley & Russell* 14986. Fuerte, *Rose, Standley & Russell* 13511.
JALISCO: Bolaños, *Rose* 3694. San Nicolás, *Hitchcock* 7209.
GUANAJUATO: Irapuato, *Hitchcock* 7428.
VERACRUZ: Camerón, *Rose & Rose* 11453.
PUEBLA: Tehuacán, *Hitchcock* 6093, 6094. Río de San Francisco, *Purpus* 4217, 4219.
MORELOS: Cuernavaca, *Hitchcock* 6831, 6872; *Pringle* 6496; *Rose, Painter & Rose* 10227.
COLIMA: Manzanillo, *Palmer* 1091 in 1890; *Orcutt* 4463; *Hitchcock* 7038.
GUERRERO: Balsas, *Hitchcock* 6785, 6798.
OAXACA: Tomellín, *Hitchcock* 6203, 6219. Oaxaca, *Pringle* 4857; *Hitchcock* 6100, 6137, 6142, 6151, 6161. Ejutla, *Liebmann* 658.
YUCATÁN: Izamal, *Gaumer* 1024.
GUATEMALA: Amatitlán, *Popenoe* 700. Aguas Calientes, *Deam* 6133.
HONDURAS: Amapala, *Hitchcock* 8770.
SALVADOR: Santa Ana, *Hitchcock* 8797. La Unión, *Hitchcock* 8786.
NICARAGUA: Grenada, *Flint* in 1868; *Levy* 385. Masaya, *Hitchcock* 8640. Corinto, *Hitchcock* 8742. San Juan del Sur, *Hitchcock* 8591.
COSTA RICA: Nicoya, *Tonduz* 13756. Guanacaste, *Jiménez* 716. Puntarenas, *Hitchcock* 8573. Atenas, *Hitchcock* 8527.
PANAMA: Panama, *Hitchcock* 8402.
BAHAMAS: Nassau, *Curtiss* 75; *Hitchcock* in 1890. Inagua, *Nash & Taylor* 926.
CUBA: Guanabo, *Léon* 8518. Río Almendares, *Wilson* 9488; *Léon* 280. Marianao, *Léon* 958, 959. Guanabacoa, *Léon & Shafer* 3443. Cojimar, *Hitchcock* 497. Triscornia, *Hitchcock* 496. Santiago, *Britton, Britton & Cowell* 12857. Pinar del Río, *Wright* 3835.
COLOMBIA: Honda, *Pennell* 3576. Santa Marta, *Smith* 134, 141.

6a. Aristida ternipes divergens (Vasey) Hitchc

Aristida schiedeana var. *minor* Vasey, Bull. Torrey Club **13**: 28. 1886. "Collected in Arizona by Pringle in 1884 * * * and by M. E. Jones at Bowie, Arizona, 1884." The first specimen, accepted as the type, is erect, about 25cm. tall, the spreading or deflexed panicles about 5 cm. long.

Aristida divergens Vasey, Contr. U. S. Nat. Herb. **3**: 48. 1892. Based on *Aristida schiedeana minor* Vasey.

DESCRIPTION.

Smaller and often prostrate or ascending, the panicle usually more than half the entire length of the plant, less diffuse, the shorter branches usually stiffly spreading or somewhat deflexed. In Griffith's no. 6970 the lateral awns are 2 to 3 mm. long or in some spikelets half as long as the central awn.

DISTRIBUTION.

Rocky hills and plains, Texas to Nicaragua.

TEXAS: Limpia Canyon, *Nealley* 135, 165. Marfa, *Havard* in 1883. El Paso, *Stearns* 196; *Griffiths* 7434; *Hitchcock* 13431. Without locality, *Wright* 745; *Buckley* in 1883; *Nealley* in 1887; *Tracy* in 1887.

NEW MEXICO: Las Cruces, *Wooton* 683. Organ Mountains, *Hitchcock* 3789; *Standley* in 1906. Mangas Springs, *Metcalfe* 632.
ARIZONA: Prescott, *Hitchcock* 13172. Portal, *Eggleston* 10936. Santa Rita Mountains, *Griffiths* 3385, 5925, 5928, 5962, 5964, 5969, 5978, 6970, 6995, 7275. Santa Catalina Mountains, *Griffiths* 7059. Dragoon Mountains, *Griffiths* 1872. Pearce, *Griffiths* 1900. Bisbee, *Mearns* 927, 1070. Tucson, *Hitchcock* 3496; *Toumey* in 1891, 1893, 1896; *Chase* 5514. Bowie, *Jones* 4234. Grape Vine Canyon, *Toumey* 142. Sierra Tucson, *Pringle* in 1884. White Mountains, *Griffiths* 5374.
LOWER CALIFORNIA: San José del Cabo, *Brandegee* in 1899. San Francisquito Mountains, *Brandegee* in 1890. Concepción Bay, *Rose* 16713.
SONORA: Alamos, *Rose, Standley & Russell* 12756.
CHIHUAHUA: Santa Eulalia Plains, *Wilkinson* in 1885.
NICARAGUA: Grenada, *Baker* 2309.

7. Aristida schiedeana Trin. & Rupr.

Aristida schiedeana Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5 [1]: 120. 1842. "Mexico: prope Jalapam (*Schiede* n. 909!)". The type specimen in the Trinius Herbarium has nearly equal, mucronate, scaberulous or puberulent glumes 10 mm. long, the lemma and column 15 mm. long, the lateral awns 1 to 2 mm. long.

Aristida virletii Fourn. Mex. Pl. **2**: 76. 1886. "Orizaba (*F. Mull.* n. 2104 in herb. Petrop.); San Luis de Potosi (*Virl.* n. 1421); Laguna, Talea, augusto (*Liebm.* n. 672); absque loco (*Liebm.* n. 657)." The type is the Virlet specimen, which could not be found in the Paris Herbarium. The other specimens have been examined.

Aristida flexuosa Fourn. Mex. Pl. **2**: 77. 1886. "Santa Fe, Julio (*Bourg.* n. 677 part.)." This specimen has been examined at Paris.

Aristida orcuttiana Vasey, Bull. Torrey Club 13: 27. 1886. "Southern California, *C. R. Orcutt.* Arizona, *M. E. Jones.*" The type is from Hansen's Ranch, Lower California (not southern California) 6,000 feet altitude, collected July 30, 1883, by C. R. Orcutt, no. 507. It differs from the average specimens of *A. schiedeana* in having smaller narrow panicles, the branches only about 5 cm. long. The blades are firm and closely involute. The Jones specimens from Arizona are similar. Most of the specimens from the southwestern United States are more like this form, but it seems scarcely worthy of specific rank.

Aristida hypomegas Mez, Rep. Sp. Nov. Fedde **17**: 146. 1921. "New Mexiko. Cooks Spring and Copper Mines (*Bigelow*)." Mrs. Agnes Chase has examined at Berlin authentic specimens named by Mez. *Bigelow* 34 may be considered the type. *Bigelow* 35 is diseased. Two other specimens, *Blumer* 3452 and *Nealley* 135 are also named *A. hypomegas* by Mez.

DESCRIPTION.

Plants perennial; culms erect, tufted, glabrous or slightly roughened or puberulent, 30 to 60 cm. or even as much as 1 meter tall; sheaths glabrous or minutely scaberulous, densely villous at the throat and on the well-marked collar, or glabrescent on these parts; blades flat or the upper involute (at least in drying), glabrous beneath, scaberulous on the upper surface, 10 to 30 cm. long, as much as 3 mm. wide, tapering to a fine point; panicle open, as much as 30 cm. long, nodding or drooping, the branches few, distant,

solitary or in pairs, scabrous, spreading and drooping or ascending, as much as 20 cm. long, branched at or above the middle, the branchlets or spikelets appressed; spikelets somewhat crowded at the ends of the branches, the pedicels angled, the shorter ones about 3 mm. long; glumes equal or the first longer, scabrous on the back or only on the keel, 1-nerved or the first with a pair of lateral nerves, 10 to 15 mm. long, acuminate or the second mucronate from a slightly bifid apex; lemma 8 to 10 mm. long, gradually narrowed into a scabrous twisted column, the total length to the bend 10 to 17 mm., the callus rather obtuse, densely pilose; central awn divergent as much as 45 degrees, straight, 5 to 10 mm. long, the lateral awns obsolete or as much as 1 mm. long, rarely longer, erect.

There is considerable variation in the measurements of the parts of the spikelet but the differences do not appear to be coordinated with each other or with other characters of the plant.

DISTRIBUTION.

Rocky hills and plains, southwestern United States to Guatemala.

TEXAS: Alpine, *Hitchcock* 13593. Without locality, *Buckley* in 1883; *Nealley* in 1887 and 1889.

NEW MEXICO: Lake Valley, *Beals* in 1914. Filmore Canyon, Organ Mountains, *Hitchcock* 3994; *Wooton* 1046. Pena Blanca, Organ Mountains, *Standley* in 1906. Socorro, *Plank* 55. Hanover Mountain, *Holzinger* in 1911. Silver City, *Metcalfe* 703. Mangas Valley, *Smith* in 1896; *Metcalfe* in 1896. Metcalfe's Ranch, Grant County, *Smith* in 1896. Without locality, *Wright* 2010, 2070.

ARIZONA: Santa Rita Reserve, *Griffiths* 5963, 7242; *Wooton* in 1914. Madero Canyon, *Wooton* in 1914. Tucson, *Toumey* 756. Webber's Camp, *Griffiths* 7175. Fort Apache, *Wooton* in 1913. Dragoon Mountains, *Griffiths* 1866. Prescott, *Toumey* 82. Fort Huachuca, *Wilcox* in 1894. Bowie, *Jones* 4233. Patagonia, *Hitchcock* 3711, 3721. Chiricahua Mountains, *Toumey* in 1896.

CALIFORNIA: San Diego, *Orcutt* in 1884.

LOWER CALIFORNIA: La Chuparosa, *Brandegee* in 1897. Sierra de San Francisquito, *Brandegee* in 1899.

CHIHUAHUA: Santa Eulalia Mountains, *Pringle* 386; *Wilkinson* 343. Chihuahua, *Pringle* 486. Sierra Madra, *Nelson* 6496a. Miñaca, *Hitchcock* 7763. Sánchez, *Hitchcock* 7671.

ZACATECAS: Plateado, *Rose* 2793.

DURANGO: Durango, *Hitchcock* 7588.

JALISCO: Río Blanco, near Guadalajara, *Palmer* 769 and 769a in 1886.

HIDALGO: Pachuca, *Hitchcock* 6752.

PUEBLA: Puebla, *Arsène* 159, 166, 245, 1669, 1903, 2289; *Purpus* 4218, 4221. San Marcos, *Hitchcock* 6526, 6539. Chalchicomula, *Hitchcock* 6273, 6299. Esperanza, *Hitchcock* 6480.

TLAXCALA: Barranca at Acuitlalpilco, *Arsène* 19.

MEXICO: Popo Park, *Hitchcock* 5971.

FEDERAL DISTRICT: *Orcutt* 3782.

MORELOS: Alarcón, *Orcutt* 3863.

MICHOACÁN: Morelia, *Arsène* 5872, 6997, 7343. Uruápan, *Hitchcock* 6975.

OAXACA: Reyes, *Nelson* 1807. Cerro de San Felipe, *Conzatti & Gonzales* 439. Talea, *Liebmann* 672.

MEXICO (Republic of): Without locality, *Liebmann* 657, 660.

GUATEMALA: Guatemala City, *Hitchcock* 9073.

8. Aristida jorullensis Kunth.

Streptachne pilosa H. B. K. Nov. Gen. & Sp. 1: 124. 1816. "Crescit cum praecedente [*S. scabra*]; item in planitie calidissima Mexicana, Playas de Jorullo, alt. 400 hexap." The sign for perennial is attached to the description, but the species is annual. The type has been examined in the Paris Herbarium.

Aristida jorullensis Kunth, Rév. Grem. 1: 62. 1829. Based on *Streptachne pilosa* H. B. K. Not *Aristida pilosa* Labill. 1824.

Ortachne pilosa Nees, Seem. Bot. Voy. Herald 225, 1857. Based on *Streptachne pilosa* H. B. K.

Aristida manzanilloana Vasey, Contr. U. S. Nat. Herb. 1: 282. 1893. "Collected in the mountains about Manzanillo by Dr. Edward Palmer, December 1 to 31, 1891 (No. 1084)." Type in the U. S. National Herbarium.

DESCRIPTION.

Plants annual; culms slender, tufted, branched at all the nodes, glabrous, 20 to 40 or even 60 cm. tall; sheaths glabrous; blades mostly less than 10 cm. long, 1 to 2 mm. wide or less, flat or involute in drying, tapering to a fine point, glabrous beneath, scabrous-puberulent on upper surface, also bearing scattered long hairs; panicles narrow, 19 to 20 cm. long, the axis slender, somewhat flexuous, the panicle and peduncle elongating at maturity, becoming as much as a meter long and more or less prostrate, the branches short, distant, floriferous to base, the axils of branches and branchlets with a few long hairs, these scattered on the branches also; glumes nearly equal, 5 to 7 mm. long, 1-nerved, or obscurely 3-nerved, glabrous; lemma scabrous on the keel, extending into a laterally compressed beak and this into the single terete scabrous curved or flexuous awn, the callus about 0.5 mm. long, rather sparsely pilose, the total length of lemma and awn being 15 to 35 mm. long, there being no distinction between the parts, the lateral awns wanting.

In the groups of spikelets on the short branches the awn of the upper spikelet is often longer than those of the lower spikelets.

DISTRIBUTION.

Dry open ground, Mexico to Panama.

SINALOA: Cerro Colorado, *Brandegee* in 1904. Mazatlán, *Rose, Standley & Russell* 13681.

TEPIC: Acaponeta, *Rose, Standley & Russell* 14303.

COLIMA: Colima, *Orcutt* 4569. Alzada, *Hitchcock* 7075. Tecomán, *Hitchcock* 7048. Manzanillo, *Palmer* 1084 in 1890.

GUERRERO: Acapulco, *Palmer* 36 in 1895.

MEXICO (Republic of): Without locality, *Liebmann* 666; *Haenke*.

GUATEMALA: Chile, *Popenoe* 710.

SALVADOR: La Unión, *Hitchcock* 8777. Acajutla, *Hitchcock* 8991. San Salvador, *Hitchcock* 8859.

NICARAGUA: Grenada, *Levy* 391. Masaya, *Hitchcock* 8657.

COSTA RICA: Grecia, *Jiménez* 1128. Nicoya, *Tonduz* 13750, 13752. Pacaca, *Pittier* 3334. Turúcares, *Pittier* 513. Nuestro Amo, *Jiménez* 409.

PANAMA: Ancón, *Killip* 4194. Chorrera, *Hitchcock* 8170. Corozal, *Hitchcock* 9202. Chepo, *Pittier* 4642, 4753. Aguadulce, *Pittier* 4850. David, *Hitchcock* 8354. Panama, *Hitchcock* 8408.

9. Aristida purpusiana Hitchc.

Aristida purpusiana Hitchc. Contr. U. S. Nat. Herb. 17: 276. 1913. "Type * * * collected at San José del Cabo, Lower California, Mexico, in 1901, by C. A. Purpus (no. 394)." Type in the U. S. National Herbarium.

DESCRIPTION.

Plants perennial; culms erect, slender, rigid, glabrous, 50 to 60 cm. high, the branches stiffly ascending; sheaths glabrous, pilose at the throat; blades 1 to 2 mm. wide, 5 to 10 cm. long, becoming involute; panicle narrowly pyramidal, 15 to 25 cm. long, the branches few, short, few-flowered, finally spreading or reflexed, the lower 5 to 6 cm. long, the branchlets and pedicels stiffly ascending; glumes somewhat unequal, the first about 6 mm., the second 8 mm. long, smooth, 1-nerved, slightly notched at the apex; lemma conspicuously pilose at the base, about 1 cm. long to base of awns, straight, minutely scabrous on the short beak, the lateral awns scarcely 1 mm. long; terminal awn about 8 mm. long, recurved by a semicircular bend.

DISTRIBUTION.

Lower California: San José del Cabo, *Purpus* 394; *Brandegee* in 1890.

10. Aristida geminiflora Fourn.

Aristida geminiflora Fourn. Mex. Pl. 2: 77. 1886. "Culmo plus quam pedali, angusto glabro; foliis amplexicaulibus convolutis fere pedalibus, ligula brevi; panicula ovali, radiis patulis brevibus, infimis longioribus alternis, superioribus geminis, pedicellis unifloris geminis inaequalibus, 8-linealibus; glumis, subaequalibus, acumnatis, flosculo maculato angusto basi piloso, arista basi torta geniculata post geniculum glumas aequante, setis lateralibus brevissimis. Mirador, januario (Liebm. n. 646)."

The description is drawn from the type, kindly lent by the director of the Copenhagen Botanical Garden. The specimen is fragmentary and gives little information as to the foliage and habit of the plant.

DESCRIPTION.

Blades and branches stiffly divergent; sheaths scaberulous, not hairy at the throat; panicle 10 to 15 cm. long, narrow, loose, erect, the branches stiffly ascending at an angle of about 45 degrees, distant, single but usually bearing a short basal branch, the lower about 3 cm. long, bearing 4 to 6 spikelets, the upper bearing 1 or 2 spikelets; glumes glabrous except the very slightly scabrous keel toward the apex, 1-nerved, mucronate, the first 12 mm. long, the second a little shorter; lemma about 8 mm. long, the callus short-pilose, the body glabrous, extending into the scabrous column of the awn, the lemma and column 14 mm. long, the lateral awns erect, less than 1 mm. long, the central awn curved in a semicircle at base, horizontal or somewhat recurved, about 8 mm. long.

Known only from the type collection.

Section Chaetaria (Beauv.) Trin. Gram. Unifl. 175. 1824.

Chaetaria Beauv. Ess. Agrost. 30, 158. *pl. 8, f. 5, 6.* 1812. Beauvois figures two species, *C. stricta*, figure 5, and *C. capillaris*, figure 6. *Chaetaria stricta*, presumably based on *Aristida stricta* Michx., is taken as the type. The

name "*C. capillaris*" occurs only in the explanation of plate, and is evidently a misprint for *C. capillacea* (presumably based on *Aristida capillacea* Lam.). The genus *Aristida* as limited by Beauvois in the work cited is based upon *Aristida lanata* Forsk., a species with plumose central awn.

Curtopogon Beauv. Ess. Agrost. 32, 159. *pl. 8. f. 7.* 1812. The figured species, *Curtopogon dichotomus*, is based on *Aristida dichotoma* Michx.

Trixostis Raf. Bull. Bot. Sering. **1**: 221. 1830. Based on *Aristida gracilis*, but the combination under *Trixostis* is not made.

Moulinsia Raf. Bull. Bot. Sering. **1**: 221. 1830. Based on *Aristida lanosa*, but the combination under *Moulinsia* is not made.

Lateral awns usually at least half as long as the central, shorter in a few species, nearly always more than 1 mm. long (rarely obsolete in *A. ramosissima*).

KEY TO THE SPECIES.

Central awn spirally coiled at the base, the lateral straight. Plants annual. (Group DICHOTOMAE.)
  Lateral awns half to two-thirds as long as the central, somewhat spreading. **11. A. basiramea.**
  Lateral awns much shorter than the central, 1 to 3 mm. long, erect.
    Glumes nearly equal, 6 to 8 mm. long; lemma sparsely appressed-pilose, 5 to 6 mm. long ---------- **12. A. dichotoma.**
    Glumes unequal, the second longer, about 1 cm. long; lemma glabrous except the keel, scabrous toward the apex, about 1 cm. long. **13. A. curtissii.**

Central awn not spirally coiled (in a few species all the awns are loosely contorted in the lower part.)
  Plants annual. (Group ADSCENSIONES.)
    Awns mostly 4 to 7 cm. long, about equal, divergent ---- **14. A. oligantha.**
    Awns mostly less than 2 cm. long, often unequal.
      Central awn with a semicircular bend at base, spreading or reflexed.
        Lateral awns much reduced; lemma about 2 cm. long. **15. A. ramosissima.**
        Lateral awns one-third to half as long as the central; lemma 4 to 5 mm. long ---------- **16. A longespica.**
      Central awn not sharply curved, the awns about equally divergent.
        Column as long as lemma, twisted; awns about 5 mm. long; plant very slender and delicate ---------- **17. A. capillacea.**
        Column short or wanting, not twisted.
          Glumes unequal; awns flat at base, 10 to 15 mm. long. **18. A. adscensionis.**
          Glumes about equal; awns terete, 15 to 20 mm. long. **19. A. intermedia.**

Plants perennial.
  Panicle open, the branches spreading (in *A. pansa* ascending), naked at base. (Group DIVARICATAE.)
    Branches of panicle stiffly and abruptly spreading or reflexed at base.
      Branchlets divaricate and implicate ---------- **20. A. havardii.**
      Branchlets appressed ---------- **21. A. divaricata.**
    Branches drooping or ascending, not abruptly spreading at base.
      Lateral awns one-fourth to half as long as the central one. **22. A. patula.**

Lateral awns about as long as the central, at least more than half as long.
Glumes unequal, the first 5 to 7 mm. the second 7 to 10 mm. long; branches of panicle stiffly ascending_____23. A. pansa
Glumes about equal; branches of panicle drooping, mostly long and slender_____24. A. spadicea.
Panicle narrow, the branches ascending or appressed (branches sometimes somewhat spreading in *A. parishii*).
Column 1 cm. or more long, twisted; glumes awned.
First glume shorter than the second; blades all involute.
25. A. spiciformis.
First glume longer than the second; basal blades flat__26. A. implexa.
Column less than 1 cm. long.
First glume about half as long as the second (as much as two-thirds as long in *A. glauca*). (Group PURPUREAE.)
Lemma tapering into a slender somewhat twisted beak 5 to 6 mm. long; awns 1.5 to 2.5 cm. long, widely spreading.
27. A. glauca.
Lemma beakless or only short-beaked.
Branches of the rather loose and nodding panicle slender and flexuous. (See also *A. longiseta rariflora.*)__28. A. purpurea.
Branches of the erect panicle stiff and appressed, or the lowermost sometimes somewhat flexuous.
Panicle mostly more than 15 cm. long, the branches several-flowered; awns about 2 cm. long. Sheaths with a villous line across the back at the collar_____30. A wrightii.
Panicle mostly less than 15 cm. long, the branches few flowered; awns 2 to several cm. long.
Culms slender and wiry, spreading at base; sheaths with a hispidulous line across the collar_____31. A. eggersii.
Culms closely cespitose, erect; no hispidulous line on collar.
Awns 1 to 1.5 cm. long_____29. A. curvifolia.
Awns 2 to 8 cm. long.
Lemma gradually narrowed above, scaberulous on the upper half; leaves mostly in a short curly cluster at the base of the plant_____32. A. fendleriana.
Lemma scarcely narrowed above, scaberulous only at the tip; leaves not conspicuously basal__33. A. longiseta.
First glume more than half as long as the second. (Usually the glumes about equal or the first sometimes a little longer.)
Sheaths lanate-pubescent.
Awns unequal, the central longer, recurved_____34. A. lanosa.
Awns about equal, somewhat spreading_____35. A. scribneriana.
Sheaths not lanate-pubescent.
Column of awn at maturity 3 to 5 mm. long, distinctly twisted. (Compare *A. recurvata.*)
Awns 10 to 15 mm. long; blades usually less than 5 cm. long, firm and straight, mostly involute_____36. A. neglecta.
Awns 1.5 to 3 cm. long; blades elongate, the older ones usually flat, curley or flexuous.
Lower blades flat; sheaths glabrous at throat.
37. A. arizonica.
Lower blades involute; sheaths villous at throat.
38. A. barbata.

Column of awn less than 3 mm. long, or if so long, not twisted.
Blades villous on upper surface near base, involute.
39. A. stricta.
Blades not involute and villous at base.
Awns at maturity about equally divergent, sometimes slightly twisted but not spirally contorted at base.
Blades flat with an involute point or becoming loosely involute, but some remaining flat at least toward the base; awns 1.5 to 2.5 cm. long. (Compare glabrous specimens of *A. lanosa*.)
Culms mostly over 1 meter tall; blades 3 to 5 mm. wide.
40. A. erecta.
Culms mostly less than 70 cm. tall; blades usually less than 2 mm. wide.
Lemma about 7 mm. long; awns horizontally spreading; panicle usually more than 20 cm. long.
41. A. purpurascens.
Lemma 10 to 12 mm. long; awns somewhat spreading but scarcely horizontal; panicle mostly less than 15 cm. long.
Awns 1.5 to 2 cm. long; glumes equal, about 10 mm. long----------**42. A. liebmanni.**
Awns 2.5 cm. long; glumes unequal, the first 12 mm. long, the second a little longer--**43. A. parishii.**
Blades involute.
Blades short and stiff, mostly less than 3 cm. long, usually approximate in pairs; culms very stiff and wiry.
44. A. curtifolia.
Blades mostly over 5 cm. long, not approximate in pairs.
Panicle loose, the branches stiffly ascending or spreading, few-flowered; awns 2 to 3 cm. long.
45. A. portoricensis.
Panicle rather dense, the branches appressed, rather densely several-flowered; awns 1 to 2.5 cm. long.
Callus of lemma nearly 2 mm. long; first glume 1 cm. long; lemma a little longer than the glumes; awns 2 cm. long----------**46. A. chaseae.**
Callus of lemma about 0.5 mm. long.
Culms erect; blades as much as 30 cm. long; first glume about 7 mm. long; lemma about 8 mm. long; awns 1.5 to 2.5 cm. long.
47. A. swartziana.
Culms spreading and branching at base; blades 5 to 15 cm. long; first glume 4 to 5 mm. long; lemma 6 to 7 mm. long; awns 1 to 1.5 cm. long.
48. A. cognata.
Awns at maturity unequally divergent, or spirally contorted at base.
Central awn horizontally spreading or reflexed by a semicircular bend, the lateral awns erect or spreading.
Lateral awns erect, two-thirds to three-fourths as long as the central.
Glumes about 12 mm. long----------**49. A. palustris.**
Glumes about 6 mm. long----------**50. A. virgata.**

Lateral awns spreading or reflexed.
Lateral awns half as long as the central; panicle rather dense, 8 to 15 cm. long----------51. **A. torta.**
Lateral awns nearly as long as the central; panicle slender, few-flowered, 10 to 30 cm. long.
Glumes 6 to 7 mm. long; spikelets mostly in pairs.
52. A. simpliciflora.
Glumes about 1 cm. long; spikelets solitary.
53. A. mohrii.
Central awn not distinguished by a semicircular bend; all the awns spirally contorted at base.
Blades flat.
Panicle slender, the branches short, rather distant, few-flowered----------**54. A. tenuispica.**
Panicle rather stout, the branches as much as 10 cm. long, rather densely many-flowered.
Lemma 8 mm. long, the beak less than 1 mm. long.
55. A. condensata.
Lemma 4 mm. long, the beak 2 to 3 mm. long.
56. A. recurvata.
Blades involute.
Callus very slender, 1.5 mm. long-------**57. A. gyrans.**
Callus 0.5 to 1 mm. long.
Awns 1.5 to 2 cm. long----------**58. A. brittonorum.**
Awns about 1 cm. long.
First glume glabrous on the keel------**59. A. rosei.**
First glume scabrous on the keel--**60. A. refracta.**

11. Aristida basiramea Engelm.

Aristida basiramea Engelm.; Vasey, Bot. Gaz. 9: 76. 1884. "This species was discovered last season by Mr. Warren Upham at Minneapolis, Minn. The late Dr. Englemann suggested the name, in a letter, as indicative of its habit, and would have published it if he had lived." Type in U. S. National Herbarium.

DESCRIPTION.

Plants annual; culms branched at base, erect, rather slender, glabrous or minutely scaberulous, usually 30 to 50 cm. tall; sheaths glabrous; blades flat, involute toward the attenuate apex, scabrous on the upper surface, strongly nerved, beset with a few long delicate hairs, glabrous on the lower surface, as much as 15 cm. long and 1.5 mm. wide; panicles terminal and axillary, the terminal narrow, loose, 5 to 10 cm. long, the short branches with 1 to a few spikelets, the axillary panicles mostly enclosed in the sheaths but breaking through at the side; glumes 1-nerved, somewhat unequal, mucronate or short-awned, the second mostly 12 to 15 mm. long, the first 2 to 3 mm. shorter, scabrous on the keel; lemma scabrous on the keel and somewhat appressed-hispid near the keel, about 1 cm. long, the callus short-pilose, the column obsolete; central awn coiled at base in 2 to 3 loose spirals, somewhat divergent, 10 to 15 mm. long, the lateral awns half to two-thirds as long, somewhat spreading.

This species differs from *A. dichotoma* and *A. curtissii* in the longer glumes and long spreading lateral awns.

DISTRIBUTION.

Open barren or sandy soil, Wisconsin to Kansas.

ILLINOIS: Barstow, *McDonald* in 1903. Oregon, *Waite* in 1888. Oquawka, *Patterson* 232. Cahokia, *Eggert* in 1874.

WISCONSIN: Camp Douglas, *Mearns* 736. St. Croix Falls, *Hale* in 1861.

MINNESOTA: St. Cloud, *Campbell* in 1883. Minneapolis, *Upham* in 1883; *Wollan* in 1893. St. Anthony Park, *Oswald* in 1911.

NORTH DAKOTA: Red River, *Wibbe* in 1888.

IOWA: Iowa City, *Somes* 197, 3796. Ames, *Pammel* 174. Wapsipinicon River, *Wilcox* 30. Guthrie Center, *Burgess* in 1879.

NEBRASKA: Lone Pine, *Bates* 1126, 1127. Thedford, *Rydberg* 1847. Rock Creek, *Clements* 2899.

KANSAS: Riley County, *Norton* 586, 590; *Hitchcock* 411.

12. Aristida dichotoma Michx.

Aristida dichotoma Michx. Fl. Bor. Amer. 1: 41. 1803. "Hab. in Carolina superiore, juxta Lincoln, in glareosis." A supplementary description of the type is given by Hitchcock in Types of American Grasses.[6]

Curtopogon dichotomus Beauv. Ess. Agrost. 32, 159. *pl. 8. f. 7.* 1812. Based on *Aristida dichotoma* Michx. Sprengel spells the name *Cyrtopogon*.[7]

DESCRIPTION.

Plants annual; culms usually much branched at base, erect or ascending, slender, glabrous or sometimes minutely scaberulous, mostly 20 to 40 cm. tall; sheaths glabrous; blades scabrous and strongly nerved on upper surface, glabrous beneath, the lower mostly flat, less than 10 cm. long and 1 mm. wide, the upper short and involute; panicles terminal and from the upper and middle axils, narrow, almost spikelike, the terminal usually less than 10 cm. long, the axis angled, scaberulous, the branches short and appressed, the lowermost as much as 2 cm. long and bearing a few spikelets, the upper bearing single spikelets, the lateral panicles small, more or less inclosed in the sheaths; glumes 1-nerved, about equal or the first a little shorter, scabrous on the keel and more or less scaberulous on the back, mucronate, mostly 6 to 8 mm. long; lemma 5 to 6 mm. long, 3-nerved, somewhat compressed above, sparsely appressed-hispidulous, the callus short, rather blunt, sparingly pubescent, the column obsolete, the central awn spirally 1 to 2 coiled at base, horizontally bent or somewhat reflexed, mostly 3 to 6 mm. long, the lateral awns a continuation of the lateral nerves, erect, usually about 1 mm. long.

DISTRIBUTION.

Dry open ground, Maine to eastern Kansas, south to Georgia and Texas.

MAINE: North Berwick, *Parlin* in 1892 (Gray Herb.).

NEW HAMPSHIRE: Seabrook, *Eaton* in 1897.

VERMONT: Without locality, *Carey*.

MASSACHUSETTS: Dennis, *Weatherby* in 1915. Dedham, *Faxon* in 1895. Medford, *Boott* in 1872. Bourne, *Pl. Exs. Gray*. 27. Essex County, *Conant* in 1879.

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[6] Contr. U. S. Nat. Herb. 12: 144. 1908.

[7] Spreng. Syst. Veg. 1: 266. 1825.

CONNECTICUT: Columbia, *Weatherby* 4414. South Windsor, *Bissell* in 1904. Bridgeport, *Eames* in 1895. Glastonbury, *Wilson* 1279. Hartford, *Driggs* 20.

RHODE ISLAND: Providence, *Collins* in 1900 (Gray Herb.). Block Island, *Fernald, Long & Torrey* 8695, 8696, 8698 (Gray Herb.).

NEW YORK: Clove, *Standley & Bollman* 12272. Shushan, *Dobbin* in 1915. Greenport, *Latham* 10.

NEW JERSEY: Farmingdale, *Pearce* in 1884.

PENNSYLVANIA: Lancaster County, *Small* in 1892; *Heller* 703. Easton, *Porter* in 1896. Philadelphia, *Smith*.

INDIANA: Grantsburg, *Deam* 30, 265.

ILLINOIS: Southern Illinois, *Vasey*.

MISSOURI: Noel, *Bush* 5271. St. Louis, *Engelmann*. Swan, *Bush* 578. Jefferson County, *Eggert* 171. Eagle Rock, *Bush* 678. Allentown, *Letterman* in 1893.

KANSAS: Cherokee County, *Hitchcock* 887.

DELAWARE: Newark, *Jackson* 1829. Mount Cuba, *Commons* 335. Carpenters Station, *Commons* 334. Silverside Station, *Commons* 118. Christiana, *Commons* 117.

MARYLAND: Chevy Chase, *Chase* 2654. Great Falls, *Chase* 2648. Millstone, *Tidestrom* 5299. Garrett County, *J. D. Smith* in 1879.

DISTRICT OF COLUMBIA: *Lapham* in 1856; *Chase* 2120; *Chase* in *Kneuck. Gram. Exs.* 562; *Dewey* 406; *Scribner* in 1894; *Vasey* in 1882; *Williams* in 1896; *Ball* 106; *Ward* in 1876.

VIRGINIA: Princess Anne County, *Kearney* 2171.

WEST VIRGINIA: Aurora, *Steele* in 1898.

NORTH CAROLINA: Black Mountain, *Standley & Bollman* 10313. Magnetic City, *Wetherby* 170.

SOUTH CAROLINA: Aiken, *Ravenel* in 1866. Oconee County, *Anderson* 1519.

GEORGIA: Stone Mountain, *Chase* 4513.

KENTUCKY: Silver Creek, *Short* in 1842.

TENNESSEE: Chattanooga, *Ball* 1814. Nashville, *Gattinger* in *Curtiss N. A. Pl.* 3423. Knoxville, *Scribner* in 1893; *Ruth* 24.

ALABAMA: Montgomery, *Mohr* in 1886. Anniston, *Mohr* in 1892. Mentone, *Mohr* in 1868. Cullman, *Eggert* 98.

MISSISSIPPI: Starkville, *Kearney* 26. Waynesboro, *Kearney* 124.

TEXAS: Burnet, *Plank* 13.

OKLAHOMA: Without locality, *Sheldon* in 1892.

13. **Aristida curtissii** (A. Gray) Nash.

Aristida dichotoma var. *curtissii* A. Gray, Man. ed. 6. 640. 1890. No specimen or locality is mentioned. In the Gray Herbarium is a specimen collected by A. H. Curtiss in Bedford County, Virginia, upon which has been written "var. *Curtissii.*" This appears to be the type. There is a note by Curtiss, "I suppose this would come under the name *A. dichotoma*, with which it grows, but the flowers are remarkably long and the glumes unequal."

Aristida curtissii Nash in Britton, Man. 94. 1901. Presumably based on *A. dichotoma curtissii* A. Gray, as A. Gray is cited in parenthesis.

DESCRIPTION.

Plants annual; culms slender, branched at the base but commonly less so than in *A. dichotoma*, usually minutely scaberulous, mostly 30 to 40 cm. tall; sheaths glabrous; blades flat or often involute, as much as 1 mm. wide, ex-

tending into a fine point; scabrous on the upper surface, glabrous beneath; panicles narrow, terminal and sometimes from the axils of the upper leaves, 5 to 10 cm. long, nearly simple; glumes unequal, 1-nerved, mucronate, the first half to two-thirds as long as the second, the latter about 1 cm. long; lemma about 1 cm. long, glabrous, scaberulous on the keel toward apex, the central awn with one or two spiral coils at base, horizontally bent, about 1 cm. long, the lateral awns erect, 2 to 4 mm. long.

This species differs from *A. dichotoma* in the less branching habit, the longer and more conspicuous leaves, the looser panicles of larger spikelets, the more unequal glumes, the longer second glume, the longer smooth lemma and central awn, and the usually longer lateral awns.

DISTRIBUTION.

Open dry ground, Maryland to Wyoming, south to Florida.

ILLINOIS: Urbana, *Waite* in 1888. Starved Rock, *Lansing* 3749. Oregon, *Waite* in 1885.
NEBRASKA: Atkinson, *Bates* 1076. Without locality, *Wibbe*.
MISSOURI: St. Louis, *Eggert* 170. Willard, *Standley* 9916. Allenton, *Kellogg* 34. Eagle Rock, *Bush* 670. Redings Mill, *Bush* 5082.
KANSAS: Kingman County, *Carleton* 542.
MARYLAND: Sandy Landing, near Great Falls, *Holm* in 1898.
VIRGINIA: Bedford County, *Curtiss* in 1873, 1874, 1875.
FLORIDA: Duval County, *Curtiss* in 1874.
OKLAHOMA: Ponca, *Stevens* 1926.
WYOMING: Merino, *Griffiths* 630.

14. Aristida oligantha Michx.

Aristida oligantha Michx. Fl. Bor. Amer. **1**: 41. 1803. "Hab. in vastissimis pratensibus Illinoensibus." The type is in the herbarium of the Paris Museum.

Chaetaria olygantha Beauv. Ess. Agrost. 30, 158. 1812. Based on *Aristida oligantha* Michx. (spelled *olygantha* by Beauvois).

Aristida micropoda Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. **5**[1]: 107. 1842. "Arkansas. (*Beyrich.*)" The type in the Trinius Herbarium at the Academy of Sciences, Petrograd, is labeled "Arkansas 115."

Aristida macrochaeta Steud. Syn. Pl. Glum. **1**: 134. 1854. Described from a panicle only, collected in Virginia by M. A. Curtis. The type has been examined at Paris.

Aristida pauciflora Buckl. Proc. Acad. Phila. **1862**: 92. 1863. "Northern Texas." This is *A. oligantha* according to Gray,[8] with which species the description agrees.

Aristida oligantha var. *nervata* Beal, Grasses N. Amer. **2**: 202. 1896. "Oregon (Grant's Pass), *Howell*." The specimen of this collection in the National Herbarium has shorter awns (2 to 2.5 cm.) than usual for this species and the first glume has 3 nerves on one side (said by Beal to be 7-nerved). Spikelets with glumes 3-nerved on one side are found in many specimens in the Eastern States.

DESCRIPTION.

Plants annual, branched at the base and all the nodes; culms slender, scaberulous below the nodes and below the panicle, mostly 30 to 50 cm. tall; sheaths glabrous; blades narrower than the sheath, flat or loosely involute, tapering into a fine point, scabrous and nerved on the upper surface, glabrous

[8] Proc. Acad. Phila. **1862**: 334. 1863.

beneath, 10 to 20 cm. long, usually not over 1 mm. wide; panicles loose, 10 to 20 cm. long, the axis scabrous; spikelets single on pedicles about 1 mm. long, or the lower branches with supplementary short branches bearing 1 or 2 spikelets, ascending or spreading; glumes about equal, 2 to 3 cm. long, gradually tapering into an awn, the first 3 to 5 nerved, or sometimes with a third nerve on one side, scabrous on the keel, the second 1-nerved, minutely scaberulous on the keel; lemma 3-nerved, minutely scaberulous on the keel, short pilose on the short callus, about 2 cm. long, narrowed into a short beak, the three awns about equal, divergent, finally horizontally spreading or even reflexed, 4 to 7 cm. long, rarely only 2 cm. long, somewhat spirally curved at base.

This species is distinguished from all our other annuals by the long divergent equal awns.

DISTRIBUTION.

Open dry ground, Massachusetts to South Dakota, south to Florida and Texas; also in Oregon and California.

MASSACHUSETTS: South Boston, *Faxon* in 1878 (Gray Herb.).
NEW JERSEY: Mickleton, *Heritage* in 1894.
PENNSYLVANIA: Philadelphia, *Krout* in 1898. Gettysburg, *Brinton* 148.
INDIANA: Miller, *Shull* in 1903; *Umbach* in 1898. Greencastle, *Grimes* 676, Marble Hill, *Deam* 30170.
ILLINOIS: Athens, *Hall* in 1869. Carlyle, *Buckley*. Barstow, *McDonald* 64. Lyons, *Hill* 168 in 1898. Medora, *McDonald* in 1903. Chester, *Reecher* 600. Augusta, *Mead* in 1845. Princeville, *V. H. Chase* 1248, 1261.
MICHIGAN: Port Huron, *Dodge* in 1912.
SOUTH DAKOTA: Jamesville, *Bruce* 57.
IOWA: Murray, *Morris* 295. Decatur County, *Fitzpatrick* in 1897. West Davenport, *Barnes & Miller* 130. Elmira, *Somes* 3914.
NEBRASKA: Weeping Water, *Williams* 3007. Lone Pine, *Bates* in 1899.
MISSOURI: Greene County, *Bush* 386. St. Louis, *Kellogg* 35, 38. Springfield, *Standley* 8336, 8906. Eolia, *Davis* 1433. Clarksville, *Davis* 1225. Jefferson County, *Eggert* 174. Sheffield, *Bush* 924. Eton, *Bush* 7746. Allenton, *Letterman* in 1892.
KANSAS: Barton County, *Hitchcock* 587, 669. Bucklin, *Smyth* 159. Riley County, *Norton* 588; *Hitchcock* 426. Wichita, *Smyth* 252.
DELAWARE: Wilmington, *Commons* in 1896. Townsend, *Canby* in 1896.
DISTRICT OF COLUMBIA: *Chase* 2755, 2756; *Dewey* 127; *Kneuck. Gram. Exs.* 563; *Pollard* in 1896; *Scribner* in 1894; *Vasey* in 1882; *Williams* in 1896.
VIRGINIA: Bedford County, *Curtiss* 3428. Arlington, *Ball* 32. Alexandria, *Shull* 222.
FLORIDA: Chipley, *Combs* 539.
KENTUCKY: Madison County, *Bain* in 1892.
TENNESSEE: Knoxville, *Ruth* 25; *Scribner* in 1853. Carroll County, *Eggert* 77.
ALABAMA: Tuskegee, *Carver* 77.
MISSISSIPPI: Starkville, *Kearney* 4. Agricultural College, *Pollard* 1299. Natchez, *Smith* in 1885.
ARKANSAS: Fayetteville, *Hitchcock* 16077. Texarkana, *Heller* 4136.
LOUISIANA: Calhoun, *Ball* 40. Shreveport, *Ball* 98; *Tracy* 3719.
TEXAS: Texarkana, *Letterman* in 1894. Terrell, *Tyler* in 1904. Cleburne, *Griffiths* 6211. Galveston, *Poor* in 1884. Fort Worth, *Ruth* 168. Gonzales, *Plank* 59. Dallas, *Reverchon* 1058, 4204, 4205. Weatherford, *Tracy* 8236. Chillicothe, *Ball* 897, 1163. Without locality, *Drummond* 341; *Wright; Nealley* in 1889.

OKLAHOMA: False Washita, *Palmer* 388, 389 in 1868. Lamont, *Stevens* 1808. Sapulpa, *Bush* 1341. Alva, *Stevens* 2877. Ponca, *Stevens* 1910. Stillwater, *Hitchcock* 16170.

OREGON: Salem, *Nelson* 985. Grants Pass, *Howell* 229. Roseburg, *Pringle* in 1881. Waldo, *Brandegee* in 1885.

CALIFORNIA: Merced Falls, *Kelsey* in 1891. Chico, *Copeland* 3488. Lake County, *Tracy* 2365. Redding, *Heller* 12450. Butte County, *Heller* 11576.

15. Aristida ramosissima Engelm.

Aristida ramosissima Engelm.; A. Gray, Man. ed. 2. 550. 1856. "Dry prairies of Illinois (Engelmann), and Kentucky (herb. Michaux)." The type in the Gray Herbarium, is labeled "Dry slopes. St. Clair Co., Illinois, *Engelmann*." A note by Gray reads "same in herb. Michaux (see notes in my copy Michx. Fl.)"

Aristida ramosissima var. *uniaristata* A. Gray, Man. ed. 5. 618. 1867. "With lateral awns wanting. Odin, s. Illinois, *Vasey*." The type, in the Gray Herbarium, was received from Vasey. The lateral awns are obsolete or reduced to short points.

DESCRIPTION.

Plants annual, branched at the base and all the nodes; culms slender and wiry, glabrous, 30 to 50 cm. tall; sheaths glabrous; blades scabrous and strongly nerved on upper surface, glabrous beneath, flat or involute, 5 to 10 cm. long, about 1 mm. wide; panicles terminating the culms and branches, narrow, loose, 8 to 12 cm. long, the axis scabrous, the spikelets single or sometimes the lower in pairs, distant 1 to 2 cm., ascending on pedicels mostly 1 to 2 mm. long; glumes 3 to 5-nerved, unequal, smooth, scaberulous toward the summit of the keels, the first acuminate, about 15 mm. long, the second about 2 cm. long including an awn 3 to 5 mm. long; lemma about 2 cm. long, including the acute short-pilose callus and a short neck, 3-nerved, smooth on the sides, scaberulous on the keel and near it, gradually narrowed above into a neck about 5 mm. long, the central awn with a semicircular bend or part of a coil at base, 15 to 20 mm. long, the terminal portion spreading or reflexed, the lateral awns much reduced (rarely obsolete) or as much as 6 mm. long, usually unequal.

DISTRIBUTION.

Open sterile soil, Indiana to Louisiana and Oklahoma.

INDIANA: Gibson County, *Deam* 29195. Leavenworth, *Deam* 18549. Washington, *Deam* 7618.

ILLINOIS: Odin, *Vasey* in 1862. Mount Carmel, *Schneck* in 1879 and 1898. Wabash County, *Patterson* in 1878.

IOWA: Mount Pleasant, *Mills* in 1894.

MISSOURI: St. Francois County, *Bush* 159. Springfield, *Standley* 9159. Campbell, *Bush* 6247.

TENNESSEE: Hollow Rock, *Biltmore Herb.* 5552.

LOUISIANA: Lake Charles, *Chase* 4411.

OKLAHOMA: Vinita, *Bush* 749; *Letterman* in 1880. Page, *Stevens* 2632.

16. Aristida longespica Poir.

Aristida longespica Poir. in Lam. Encycl. Suppl. 1: 452. 1810. Collected by Bosc in "Caroline." The type could not be found in the Webb Herbarium in Florence (where many of Poiret's types are preserved) nor in Paris, but the description of the branched stem, slender spike, equal glumes and un-

equal awns, the central one divergent, can apply only to what has commonly been called *A. gracilis* Ell.

Aristida gracilis Ell. Bot. S. C. & Ga. **1**: 142. *pl. 8. f. 3.* 1816. "Grows in the vicinity of Charleston." The type is in the Elliott Herbarium, now in the Charleston Museum, where it was examined by Merrill.[9]

Aristida geniculata Raf. Amer. Month. Mag. **2**: 119. 1817. "Very common on the Hempstead plains, and on the seashore near Oyster Bay, Gravesend, etc., on Long Island." A specimen of this from Rafinesque has been examined at the Delessert Herbarium. According to Merrill[10] there is another in the Elliott Herbarium.

Aristida gracilis var. *depauperata* A. Gray, Man. ed. 5. 618. 1867. "On micaceous hills near Philadelphia (C. E. Smith)." The type, in the Gray Herbarium, has lateral awns about 2 mm. long, the central awn 5 to 10 mm. long.

Aristida simplicifolia [error for *simpliciflora*] var. *texana* Vasey, Contr. U. S. Nat. Herb. **3**: 44. 1892. "Texas." I have been unable to find the type specimen of this. The meager description says "spikelets smaller [than in *A. simpliciflora*], lateral awns 1 to 2 lines long," which would indicate *A. gracilis*.

Trixostis gracilis Raf. Ind. Kew. **4**: 1131. 1895. Based on *Aristida gracilis* Ell.

DESCRIPTION.

Plants annual, branched at base and some of the lower nodes; culms erect or geniculate at base, slender, glabrous, mostly 20 to 40 cm. tall; sheaths glabrous; blades flat or involute, scabrous and strongly nerved on the upper surface, glabrous beneath, mostly less than 10 cm. long and 1 mm. wide; panicles narrow and slender, the terminal mostly 10 to 15 cm. long, sometimes as much as 20 cm., the axis scaberulous, the spikelets appressed, single or as many as six on short branches, rather distant, especially below, the axillary panicles often much reduced; glumes about equal, scabrous on the keel, about 5 mm. long, the first 3-nerved, acuminate, the second 1-nerved, mucronate from between two very short lobes; lemma 3-nerved, scabrous along the keel, scarcely beaked, 4 to 5 mm. long, the short callus minutely pilose, the central awn sharply curved at base, horizontally spreading or somewhat reflexed, 5 to 15 mm. long, the lateral awns erect or somewhat divergent, usually one-third to half as long as the central, sometimes only 1 mm. long.

DISTRIBUTION.

Sterile or sandy soil, New Hampshire to Michigan, south to Florida and Texas.

NEW HAMPSHIRE: Pelham, *Batchelder* in 1902 (Gray Herb.)
VERMONT: Vernon, *Grout* in 1895 (Gray Herb.)
MASSACHUSETTS: Sturbridge, *Knowlton* 996. Salem, *Scars*. Middlesex County, *Conant* in 1880.
CONNECTICUT: Old Lyme, *Bissell* in 1904.
NEW YORK: Northville, *Young* in 1872.
NEW JERSEY: Camden, *Scribner* in 1881. Medford, *Commons* 332. Batsto. *Commons* 337.
PENNSYLVANIA: Germantown, *Scribner* in 1879.
OHIO: Erie County, *Mosley* in 1902.

[9] U. S. Dept. Agr. Div. Agrost. Circ. **29**: 10. 1901.
[10] Loc. cit.

INDIANA: Corydon, *Deam* 18678. North Vernon, *Deam* 10267.
ILLINOIS: Athens, *Hall* in 1869. Mount Carmel, *Schneck* in 1879. Union County, *Wolf.*
MICHIGAN: Port Huron, *Dodge* in 1900 (Gray Herb.).
MISSOURI: Jefferson County, *Eggert* 172. St. Louis, *Glatfelter* in 1895. Eagle Rock, *Bush* 674. Strafford, *Standley* 9424. Webb City, *Palmer* 3840.
DELAWARE: Woodland Beach, *Commons* 333. Centerville, *Commons* 119. New Castle, *Commons* 338. Greenbank, *Commons* 336. Georgetown, *Commons* 78.
MARYLAND: Lanham, *Hitchcock* 2394.
DISTRICT OF COLUMBIA: *Steele* in 1896; *Vasey* in 1882; *Blanchard* in 1891; *Chase* 305.
VIRGINIA: Bedford County, *Curtiss* in 1871 (Gray Herb.).
NORTH CAROLINA: Wilmington, *Chase* 4596. Biltmore, *Biltmore Herb.* 1106a.
SOUTH CAROLINA: Santee Canal, *Ravenel* (Gray Herb.).
GEORGIA: Stone Mountain, *Hitchcock* in 1905.
FLORIDA: Jacksonville, *Curtiss* 4043; *Kearney* 172. Quincy, *Nash* 2558. Grasmere, *Combs* 1118.
KENTUCKY: Wasioto, *Kearney* 368. Bowling Green, *Eggert* 96.
TENNESSEE: Nashville, *Curtiss N. A. Pl.* 3424. Knoxville, *Ruth* 30.
ALABAMA: Auburn, *Tracy* 3779.
MISSISSIPPI: Biloxi, *Tracy* 3776, 6475; *Kearney* 236½; *Chase* 4335, 4339, 4363. Waynesboro, *Kearney* 142. Nicholson, *Kearney* 364. Scranton, *Tracy* 4664. Ocean Springs, *Tracy* 4666.
ARKANSAS: Pine Bluff, *Hitchcock* 16122. Texarkana, *Letterman* in 1894. Benton County, *Plank* 29. Red River Parish, *Ball* 128. Calhoun, *Ball* 57. Oberlin, *Ball* 198. Natchitoches, *Ball* 155.
LOUISIANA: Covington, *Arsène* 11212. Mandeville, *Langlois* 145.
TEXAS: Texarkana, *Heller* 4250. Marshall, *Riggs* 79. West Point, *Plank* 4. Jefferson, *Plank* 15. Dallas, *Reverchon* 1214. Milano, *Griffiths* 6553.
OKLAHOMA: Sapulpa, *Bush* 754 (Gray Herb.).

17. **Aristida capillacea** Lam.

Aristida capillacea Lam. Tabl. Encycl. 1: 156. 1791. "Ex America merid. Communic. à D. Richard." The type, in the Paris Herbarium, is from Cayenne.

Aristida elegans Rudge, Pl. Guian. 22. *pl. 30.* 1805. The species is described from British Guiana. but no definite locality is cited. Type not seen.

Chaetaria capillacea Beauv. Ess. Agrost. 30, 158. *pl. 8. f. 6.* 1812. Based on *Aristida capillacea* Lam. The name is given erroneously in the Atlas as *capillaris.*

Aristida sanctae-luciae Trin. Gram. Pan. 25. 1826. "V. spp. Brasil." The type, in the Trinius Herbarium, is *Martius* 850.

Chaetaria capillaris Nees, Agrost. Bras. 388. 1829. Based on *Aristida capillacea* Lam. Nees seems to have changed the name inadvertently. He cites as synonyms *Chaetaria capillacea* Beauv., *Aristida capillacea* Lam., and *A.* "*capillaris* Cav. Ic. tab. 468. f. 1." The name is given by Cavanilles as *A. capillacea* Lam., but the plant described is an allied species from the Philippines, afterwards named *A. cumingiana* Trin. & Rupr.

DESCRIPTION.

Plants annual, mostly much branched and closely cespitose at base; culms erect, slender and delicate, glabrous, 10 to 20 cm. tall, sometimes taller; sheaths glabrous; blades flat or more or less involute, scaberulous and beset with

scattering long hairs on the upper surface, glabrous beneath, mostly less than 5 cm. long, 0.5 to 1.5 mm. wide; panicles oblong, open, rarely more than 7 cm. long, 2 to 3 cm. wide, the branches capillary, scaberulous, naked below, the lower mostly in three's, often branching in three's above the middle, the spikelets long-pediceled; glumes unequal, acuminate, scaberulous on the nerves, the first 3-nerved, 2.5 mm. long, the second 1-nerved, about 3 mm. long; lemma slender, scarcely 2 mm. long, minutely pilose on the callus, glabrous below, minutely scaberulous toward summit, extending into a slender twisted scaberulous column of about 2 mm., the total length of the lemma and column being 3 to 4 mm.; awns nearly equal, about 5 mm. long, very slender and delicate, somewhat divergent, slightly spirally curved toward base.

Distinguished from all other species of *Aristida* by the delicate habit.

DISTRIBUTION.

Dry savannas, pastures, and open ground, southern Mexico to Brazil and Bolivia.

VERACRUZ: Minatitlán, *Smith* 565. Without locality, *Karwinsky* (a fragment from the Trinius Herb.)

BRITISH HONDURAS: In 1871, the collector not given.

COSTA RICA: Boruca, *Pittier* 4451. Terraba, *Pittier* 3629. Mano de Tigre, *Tonduz* 4631. Buenos Aires, *Tonduz* 3635, 3690. Rodeo, *Pittier* 1613. Hacienda La Argentina, *Jiménez* 1124, 1125.

PANAMA: San Felix, *Pittier* 5194. Corozal, *Hitchcock* 9197. Tortuga, *Pittier* 3315. Pacora, *Killip* 4203. Bajo Boquete, *Killip* 4588.

COLOMBIA: Santa Marta, *Smith* 138. Without locality, *Linden* 1557.

VENEZUELA: Tovar, *Fendler* 2520.

BRITISH GUIANA: Mount Roraima, *Loyed* 12. Without locality, *Jenman* 7280; *Schomburgk* 799.

DUTCH GUIANA: Without locality, *Hostmann* 1024; *Weigelt; Hering.*

BRAZIL: Cuyabá, *Malme* 1556. Buritzinho, *Lindman* 3361. Dimantino, *Lindman* 3397. Without locality, *Burchell* 5419, 8757; *Jard. Bot. Herb.* 3608; *Riedel* 967; *Glaziou* 17438, 22566. Lagoa Santa, *Warming* in 1863.

BOLIVIA: Guanai, *Rusby* 208.

ARISTIDA SETIFOLIA H. B. K. Nov. Gen. & Sp. 1: 122. 1816. "Crescit in apricis Novae Andalusiae [Venezuela], inter Bordones et Cumana."

Differs from *A. capillacea* in the more robust habit, involute-setaceous blades, the narrower panicles, and the larger spikelets.

COLOMBIA: Without locality, *Linden* 1563.

VENEZUELA: Caracas, *Pittier* 8245.

BRAZIL: São João d'El Rey, *Dorsett & Popenoe* 275b. Piauhy, *Jard. Bot. Herb.* 5542; *Gardner* 2371. Pratenha, *Dorsett & Popenoe* 192b. Cuyabá, *Malme* 1494, 3529.

Aristida cumingiana Trin. & Rupr. of the Philippines differs from *A. capillacea* in having a short untwisted column to the fruit.

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18. Aristida adscensionis L.

Aristida adscensionis L. Sp. Pl. 82. 1753. "In Insula Adscensionis," one of four species of plants found on the island, according to Linnaeus. I have not examined the type, which is in the Linnaean Herbarium.

Chaetaria ascensionis Beauv. Ess. Agrost. 30. 151, 158. 1812. Based on *Aristida a[d]scensionis* L.

Aristida humilis H. B. K. Nov. Gen. & Sp. 1: 121. 1816. "Crescit in exustis Cumanae." Described as being 3 to 6 inches tall and having simple panicles 2 to 3 inches long. Type not seen.

Aristida bromoides H. B. K. Nov. Gen. & Sp. 1: 122. 1816. "Crescit in montanis regni Quitensis, juxta Tambo de Guamote et Llanos de Tiocaxas, alt. 1600 hexap." Type not seen.

Aristida coarctata H. B. K. Nov. Gen. & Sp. 1: 122. 1816. "Crescit in alta planitie Mexicana, inter Burros et Guanaxuato, alt. 1060 hexap." The type has been examined at Paris. There are two plants on the sheet, only one of which, the left-hand specimen, accepted as the type, corresponds to the description in having unequal glumes. The description notes "Praecedente [*A. bromoides*] valde affinis." All three of the above are said to be perennial.

Chaetaria humilis Roem. & Schult. Syst. Veg. 2: 396. 1817. Based on *Aristida humilis* H. B. K.

Chaetaria bromoides Roem. & Schult. Syst. Veg. 2: 396. 1817. Based on *Aristida bromoides* H. B. K.

Chaetaria coarctata Roem. & Schult. Syst. Veg. 2: 396. 1817. Based on *Aristida coarctata* H. B. K.

Chaetaria coarctata Roem. & Schult. Syst. Veg. 2: 396. 1817. Based on *Aristida coarctata* H. B. K.

Aristida fasciculata Torr. Ann. Lyc. N. Y. 2: 154. 1826. "In forests of the Canadian river." The exact locality is not known, but probably is in Oklahoma or northern Texas. The type specimen, in the Torrey Herbarium at the New York Botanical Garden, is the somewhat open-panicled form.

Chaetaria fasciculata Schult. Mant. 3: 578. 1827. Based on *Aristida fasciculata* Torr.

Aristida nigrescens Presl, Rel. Haenk. 1: 223. 1830. "Hab. in Mexico." The type has been examined at the German University, Prague. No locality is given on the label. A duplicate in the Bernhardi Herbarium is illustrated by Scribner.[11]

Aristida dispersa Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 129. 1842. A group name including five varieties, of which the first, "A. nana Steudel Nomencl. 1841," may be taken as the type of the group.

Aristida dispersa nana Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 129. 1842. This variety is cited as quoted in the preceding paragraph. The name only appears in Steudel's Nomenclator[12] as "*A. nana* Steud. Chili," with the synonym *Chaetaria nana* Nees, which also is a nomen nudum, and the citation of a specimen "Festuca? nr. 994. Berter. hrb." Trinius and Ruprecht cite three specimens, all from Chile: Valparaíso, *Cuming;* Concon, *Pöppig;* Quillota, *Bertero* 994. The Bertero specimen, being also cited by Steudel, may be accepted as the type of variety *nana*, and hence also of *A. dispersa*. This specimen has been examined at the Trinius Herbarium.

Aristida dispersa humilis Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 129. 1842. The variety is cited as "*β. A. humilis* H. B. K."

Aristida dispersa bromoides Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 130. 1842. "*γ. A. bromoides* H. B. K."

Aristida dispersa coarctata Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 130. 1842. "*δ. A. coarctata* H. B. K."

Aristida dispersa nigrescens Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 130. 1842. "*ε. A. nigrescens* Presl."

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[11] Grasses of the Bernhardi Herbarium. Rep. Mo. Bot. Gard. 10: 39. *pl. 27.* 1899.

[12] Steud. Nom. Bot. 1: 131. 1841.

Aristida maritima Steud. Syn. Pl. Glum. **1**: 137. 1854. "In maritimis Guadeloupe." The type has been examined at Paris.

Aristida nana Steud. Syn. Pl. Glum. **1**: 137. 1854. "*A. dispersa* α (Rupr. Trin.) Festuca? nr. 994. Bert. hrbr. Chili."

Aristida schaffneri Fourn. Mex. Pl. **2**: 78. 1886. Several specimens are cited, the first being *Liebmann* 661, which is *A. adscensionis*. The type, *Schaffner* 181, from Orizaba, has been examined at Paris.

Aristida grisebachiana Fourn. Mex. Pl. **2**: 78. 1886. Two specimens are cited, *Schaffner* 175 in part, Pl. Hohenacker, and *Schaffner* 53. Fournier also describes a variety *decolorata*, "Glumis et flosculis decoloratis," based upon *Liebmann* 663 and 664, both of which are *Aristida adscensionis*. In the Paris Herbarium, *Schaffner* 175 (ed. Hohenacker) is labeled "*Aristida stricta* var. Griseb." This is selected as the type, as it appears to be the basis of Fournier's specific name.

Aristida americana bromoides Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Circ. **32**: 5. 1901. Based on *Aristida bromoides* H. B. K. Scribner and Merrill in the circular cited and also in circular 34 (page 3) misapply the name *Aristida americana* to *A. adscensionis* (see page 586).

Aristida debilis Mez, Repert. Sp. Nov. Fedde **17**: 151. 1921. "Venezuela (*Moritz*); Jamaica (*MacNab*)." The cited specimens, bearing the name in Mez's script, were examined by Agnes Chase at Berlin. The Moritz specimen (no. 1522) is not the same as the MacNab specimen, which is *A. adscensionis*. As the description applies better to the MacNab specimen (especially as to the spikelet), this is taken as the type.

I have not attempted to give synonymy of *A. adscensionis* in the Old World.

DESCRIPTION.

Plants annual, much branched at base; culms erect or geniculate at base, glabrous, 10 to 80 cm. tall; sheaths glabrous; ligule a densely ciliate membrane nearly 1 mm. long; blades scabrous on the upper surface, glabrous beneath, on the smaller plants mostly short and involute, on the larger plants sometimes flat and as much as 10 cm. long and 2 mm. wide; panicles terminal, narrow, erect and 5 to 10 cm. long in the smaller plants, often loose, somewhat drooping, and as much as 15 cm. long or even longer in the larger plants, the axis mostly glabrous below, scabrous above; glumes unequal, 1-nerved, the first 5 to 7 mm. long, obtuse or acutish, scaberulous on the keel, the second 8 to 10 mm. long, narrowed to a bluntish, notched, or acute point, the keel slightly scaberulous toward the summit; lemma about as long as the second glume, 6 to 9 mm. long, densely short-pilose on the rather obtuse callus, compressed toward the scarcely beaked summit, scabrous on the upper part of the keel, and sometimes on the sides toward the summit; awns about equal, mostly 10 to 15 mm. long, about equally divergent at an angle of as much as 45 degrees, very scabrous, flat, and without torsion at base, gradually narrowed to a fine terete point.

DISTRIBUTION.

Dry open ground, southern Kansas to Texas, west to southern California, south through Mexico and the West Indies and through the Andean region to Chile; also in the warmer regions of the Old World.

MISSOURI: Courtney (introduced), *Bush* in 1891.

KANSAS: Comanche County, *Hitchcock* 888. Clark County, *Carleton* 516.

TEXAS: El Paso, *Rose & Fitch* 18158; *Hitchcock* 7813, 13335, 13424; *Griffiths* 7330. Alpine, *Hitchcock* 13607. Big Spring, *Hitchcock* 13380. Abilene, *Bentley* in 1899. Limpia Canyon, *Nealley* 163. Amarillo, *Hitchcock* 16183, 16217. Magenta, *Ball* 1649. Rio Pecos, *Havard* 63. Tascosa, *Reverchon* 2830. Fort Stockton, *Ball* 1515. Guadalupe Mountains, *Havard* in 1881. Without locality, *Wright* 740, 741.

COLORADO: Canyon City, *Shear* 974b. Bayfield, *Wooton* 2797.

NEVADA: Rioville, *Jones* 5034. Mica Spring, *Jones* 5064.

NEW MEXICO: Grant County, *Blumer* 173. Mangas Springs, *Metcalfe* 643. Mangas Valley, *Smith* in 1896. White Sands, *Wooton* 396. Las Cruces, *Wooton* 2003; *Griffiths* 7415. Fierro, *Holzinger* in 1911. Filmore Canyon, *Hitchcock* 3785, 3805. Mesilla Park, *Hitchcock* 3831. Ojo Caliente, *Wooton* 2864. Socorro, *Plank* 46; *Vasey* in 1881. Queen, *Hitchcock* 13525, 13554, 13559. West of Guadalupe Mountains, *Hitchcock* 13568. Carlsbad, *Hitchcock* 13480, 13494. Santa Fe, *Heller* 3754. Anton Chico, *Rose & Fitch* 17641, 17667. Chamita, *Wooton* 2986. Roswell, *Earle* 559; *Griffiths* 5754. Deming, *Griffiths* 3323; *Hitchcock* 3744. Trujillo Creek, *Metcalfe* 1360. Cimarron Canyon, *Griffiths* 5577, 5586. Without locality, *Wright* 2001; *Fendler* 975 (Gray Herb.).

ARIZONA: Santa Rita Mountains, *Pringle* in 1884; *Griffiths* 198, 253, 292, 3392, 3419, 3814, 4163, 6083, 6980, 7191, 7272, 7274. Tucson, *Griffiths* 1528, 3346, 3636, 7301, 7311; *Hitchcock* 3487, 3508; *Chase* 5510. Phoenix, *Wooton* 7010. Santa Catalina Mountains, *Griffiths* 7132. Portal, *Eggleston* 10732, 10933. Oracle, *Hitchcock* 13258, 13264. Cibola Valley, *Jepson* 5282. Celero Mountains, *Griffiths* 6131, 6132. Rincon Mountains, *Griffiths* 1808. Camp Lowell, *Pringle* in 1881. Canoa, *Griffiths* 3566. Benson, *Griffiths* 1853. Pearce, *Griffiths* 1926. Harts Ranch, *Rusby* 875. Valley of Colorado, *Palmer* 542 in 1876. Paradise, *Blumer* 1717. South of Bisbee, *Mearns* 861, 1027, 1029. Quitovaquito, *Mearns* 2759. Patagonia, *Hitchcock* 3672. White Water, *Mearns* 2264.

CALIFORNIA: Santa Catalina Island, *Brandegee* 56. Baxter, *Parish* 9888. Palm Canyon, *Johnston* 1011. San Diego, *Baker* 832. Mecca, *Parish* 8122. Near Monument 233, *Schoenfeldt* 3227. Dixieland, *Parish* 8239. Palo Verde Valley, *Jepson* 3262. San Luis Obispo, *Jones* 3245. Andreas Canyon, *Wilder* 1046. Murray Canyon, *Wilder* 1080. Funeral Mountains, *Coville & Funston* 259. Needles, *Jones* 3788; *Chase* 5793. Marshall Canyon, *Hall* 5797. Colorado River, *Hall* 5963.

LOWER CALIFORNIA: Calmallí, *Purpus* 231; *Orcutt* in 1899. Carmen Island, *Palmer* 858 in 1890. Santa Gertrudis, *Orcutt* in 1899. Indian Wells, *Orcutt* 2033. Volcán de las Tres Vírgenes, *Orcutt* in 1899. San José del Cabo, *Brandegee* in 1890. San Julio, *Brandegee* in 1889. Sierra de San Francisquito, *Brandegee* in 1899. La Paz, *Palmer* 127 in 1890. Lagoon Head, *Palmer* 651 in 1889. Los Angeles Bay, *Palmer* 503 and 504 in 1887. Cedros Island, *Palmer* 665 in 1889. Guadalupe Island, *Palmer* 669 and 675 in 1889. Santa Rosalía, *Palmer* 270 in 1890. Signal Mountain, *Schoenfeldt* 2951. Cape San Lucas, *Rose* 16936. Guadalupe Island, *Rose* 16951.

SONORA: Guadalupe Canyon, *Merton* 2033. Yaqui River, *Palmer* 2 in 1869. Álamos, *Rose, Standley & Russell* 12699. Guaymas, *Palmer* 273 in 1890, 66, 503, and 504 in 1887; *Hitchcock* 3555; *Maltby* 197. Hermosillo, *Hitchcock* 3540, 3589. Llano, *Hitchcock* 3529. Quitovaquito, *MacDougal* in 1907. La Colorada, *Clokey* 1924.

CHIHUAHUA: Chihuahua, *Pringle* 390: *Hitchcock* 7796. Miñaca, *Hitchcock* 7755. Sierra en Media, *Nelson* 6466. Between Casas Grandes and Sabinal, *Nelson* 6369.

COAHUILA: Saltillo, *Palmer* 333 in 1904; *Hitchcock* 5632; *Palmer* 388 in 1898. Parrás, *Palmer* 1352 in 1880.
NUEVO LEÓN: Monterrey, *Hitchcock* 5526½.
TAMAULIPAS: Buena Vista Hacienda, *Wooton* in 1919.
SAN LUIS POTOSÍ: San Luis Potosí, *Schaffner* 165; *Hitchcock* 5674, 5710.
ZACATECAS: Zacatecas, *Hitchcock* 7498, 7511. Plateado, *Rose* 2703.
DURANGO: Durango, *Palmer* 535 in 1896, 767 in 1896; *Hitchcock* 7581, 7602. Tlahualilo, *Pittier* 469. Torreón, *Holway* 16½; *Hitchcock* 7544.
SINALOA: Fuerte, *Rose, Standley & Russell* 13521. Topolobampo, *Rose, Standley & Russell* 13269.
JALISCO: Guadalajara, *Hitchcock* 7264. Near San Pedro, *Hitchcock* 7266. Río Blanco, *Palmer* 474, 501, 501a, 517 in 1886. Zapotlán, *Hitchcock* 7116. San Nicolás, *Hitchcock* 7191. Chapala, *Holway* 3472; *Rose & Painter* 7624. Colotlán, *Rose* 2812.
AGUASCALIENTES: Aguascalientes, *Hitchcock* 7447, 7478.
GUANAJUATO: Irapuato, *Hitchcock* 7429. Acámbaro, *Hitchcock* 6924, 6954.
QUERÉTARO: Querétaro, *Hitchcock* 5832.
HIDALGO: Dublán, *Pringle* 9597. Pachuca, *Hitchcock* 6727. Telles, *Orcutt* 4130.
PUEBLA: Tehuacán, *Hitchcock* 6048½, 6075.
FEDERAL DISTRICT: Pedregal, *Hitchcock* 5937; *Pringle* 6227; *Schaffner* 164; *Rose & Painter* in 1903; *Arsène* 8874.
MORELOS: Cuernavaca, *Hitchcock* 6865.
MICHOACÁN: Morelia, *Arsène* 3097, 5890.
OAXACA: Oaxaca, *Hitchcock* 6100½, 6138, 6165. Cuicatlán, *Nelson* 1654. Tomellín, *Rose, Painter & Rose* 10086; *Hitchcock* 6194. Las Sedas, *Smith* 918, 931.
YUCATÁN: Mérida, *Schott* 601.
GUATEMALA: Guatemala, *Hitchcock* 9026, 9097. Santa Ana, *Türckheim* 468.
BAHAMAS: Long Cay, *Brace* 4077. Crooked Island, *Brace* 6309. Long Island, *Britton & Millspaugh* 6309. Fortune Island, *Hitchcock* in 1890.
JAMAICA: Kingston, *Harris* 11500, 12452; *Britton & Hollick* 1746. Gordon Town, *Harris* 11513. Flamstead, *Harris* 11474. Musgrave Road, *Harris* 11480.
PORTO RICO: Boqueron, *Chase* 6506, 6510. Guanica, *Sintenis* 3438, 3766. Cabo Rojo, *Sintenis* 553. Mona Island, *Hess* 437.
VIRGIN ISLANDS: St. Croix, *Ricksecker* 64; *Rose, Fitch & Russell* 3211.
LEEWARD ISLANDS: Guadeloupe, *Duss* 3159. Antigua, *Wullschlaegel*.
WINDWARD ISLANDS: Montserrat, *Shafer* 18.
CURAÇAO: *Curran & Haman* 11, 23 in part, 126; *Britton & Shafer* 2958.
VENEZUELA: San Joaquín, *Pittier* 8228. Tovar, *Fendler* 1668. Caracas, *Rose* 21643. Barquisivieto, *Pittier* 6408.
COLOMBIA: Santa Marta, *Smith* 2184.
PERU: Obrajillo, *Wilkes Exped.* Ollantaytambo, *Cook & Gilbert* 520. Tingo, *Rose* 18802.
BOLIVIA: Illimani, *Buchtien* 208. Tarija, *Fries* 1065.
ARGENTINA: Córdoba, *Stuckert* 1705, 11707, 13139, 17307. Sierra Achala, *Galander* 1281.
CHILE: Nahuelbuta, *Claude-Joseph* 100. Pudahuel, *Claude-Joseph* 114. La Ligua, *Rose* 19461. Province of Aconcagua, *Philippi* in 1888.

19. Aristida intermedia Scribn. & Ball.

Aristida intermedia Scribn. & Ball, U. S. Dept. Agr. Div. Agrost. Bull. 24: 44. *f. 18.* 1901. "Type collected by T. H. Kearney, jr., No. 204, near Biloxi, Mississippi, October 5, 1896." Type in the U. S. National Herbarium.

DESCRIPTION.

Plants annual, branched at base or often simple; culms slender, erect, glabrous, or scaberulous below the panicle, 20 to 40 cm. tall; sheaths glabrous; blades flat or involute, scabrous and strongly nerved on the upper surface, glabrous or scaberulous beneath, mostly less than 10 cm. long and 2 mm. wide; panicles narrow, slender, loosely flowered, 10 to 20 cm. long, the axis scabrous, the spikelets single or a few on short appressed branches, the lower usually distant; glumes about equal, 1-nerved, about 1 cm. long, narrowed into a short awn, scabrous on the keel; lemma about 8 mm. long, 3-nerved, scaberulous toward the summit, scarcely beaked, minutely pilose on the acute callus, the awns about equal, or the lateral sometimes shorter, all somewhat divergent, mostly 1.5 to 2 cm. long.

This species differs from *A. longespica* in the looser racemes, the longer glumes and lemma, and the longer lateral awns, these about as long as the central.

DISTRIBUTION.

Low sandy soil; Indiana and Iowa to Mississippi and Texas.

INDIANA: Pine, *Hill* 187 in 1898. Millers, *Umbach* in 1897; *Chase* 683; *Lansing* 4017.
IOWA: Wapsipinicon River, *Wilcox* 31.
NEBRASKA: Simeon, *Bates* 1115. Ewing, *Bates* 1075.
MISSOURI: Courtney, *Bush* 649, 7090.
KANSAS: Riley County, *Hitchcock* 425.
MISSISSIPPI: Scranton, *Tracy* 4664. Biloxi, *Tracy* 236, 3774, 3776. Horn Island, *Tracy* 1578.
ARKANSAS: Jefferson County, *Eggert* 125.
LOUISIANA: Arcadia, *Ball* 78.
TEXAS: Dallas, *Reverchon* 1858. Galveston, *Tracy* 7410. Handley, *Reverchon* 3480A. Sarita, *Hitchcock* 5475. Gonzales, *Plank* 58. Houston, *Fischer* 2050. Without locality, *Nealley; Buckley; Thurow.*
OKLAHOMA: Morrison, *Stevens* 2804. Hattenville, *Stevens* 2479.

20. Aristida havardii Vasey.

Aristida havardii Vasey, Bull. Torrey Club 13: 27. 1886. "Collected in western Texas by Dr. Havard." The type, in the U. S. National Herbarium, was collected by Havard (no. 28), October, 1883, in "W. Texas. Prairie. Ft. Davis, Marfa, &c." The specimen includes two culms about 30 cm. tall.

DESCRIPTION.

Plants perennial, forming hemispheric tufts as much as 30 cm. in diameter, the culms rather stiffly radiating in all directions; culms densely cespitose, glabrous, slender, 15 to 30 cm. tall; sheaths glabrous, villous at the throat, more or less hispidulous on the collar; blades closely involute, slender, scabrous or scabrous-pubescent on the upper surface, glabrous or somewhat roughened beneath, scaberulous near the tip, scabrous on the margins, mostly less than 10 cm. long, mostly less than 0.5 mm. thick when rolled; panicles about half the length of the entire culm, open, the axis scabrous, the branches divaricately spreading or somewhat reflexed, mostly 3 to 6 cm. long, in pairs or with short basal branchlets, but without long naked base, the branchlets and pedicels scabrous, divaricate and implicate or flexuous, the whole panicle fragile at maturity, breaking away and rolling before the wind; glumes about equal,

acuminate or awn-pointed, about 1 cm. long, the first 1-nerved or obscurely 3-nerved, scabrous on the keel and obscurely so on the lateral nerves, the second 1-nerved, scaberulous only near the tip; lemma gradually narrowed into a straight or twisted scaberulous beak, the entire length 8 to 10 mm. and usually a little shorter than the glumes, the pubescent or hispidulous callus about 1 mm. long; awns somewhat divergent, scabrous, scarcely curved or warped at base, nearly equal, mostly 15 to 20 mm. long.

This species is closely allied to *A. divaricata*, but is distinguished by the hemispheric habit of growth and the flexuous or implicate branchlets and pedicels. In *A. divaricata* the culms are often prostrate or nearly so but do not form hemispheric tufts; the main branches are naked at base and the pedicels usually appressed along the upper part of the branches. In *A. havardii* the branches are shorter and bear a basal branch, so that the spikelets are evenly distributed through the panicle.

DISTRIBUTION.

Hills and plains, western Texas to Arizona and central Mexico.

TEXAS: Limpia Canyon, *Nealley* 134. Alpine, *Hitchcock* 13620. Amarillo, *Ball* 1146, 1265, 1610; *Reverchon* 4118; *Hitchcock* 16215. Marfa, *Havard* 28.

NEW MEXICO: Artesia, *Hitchcock* 13447. Bonito Crossing, *Wooton* in 1905. West of Guadalupe Mountains, *Hitchcock* 13576. Red Lake, *Wooton* in 1913. Carlsbad, *Hitchcock* 13466; *Tracy* 8198. Gray, *Earle* 561; *Skehan* 57. Grants, *Jones* in 1884. Fort Bayard Watershed, *Blumer* 204. Albuquerque, *Jones* in 1884. Roswell, *Griffiths* 5730, 5753. Stanley, *Wooton* 2954. Grant County, *Rusby* 447. Deming, *Hitchcock* 3747.

ARIZONA: Cochise, *Griffiths* 1885. San Francisco Mountains, *Rusby* 447c. Fort Huachuca, *Wilcox* 423.

CHIHUAHUA: Miñaca, *Hitchcock* 7736.

ZACATECAS: Zacatecas, *Hitchcock* 7518.

DURANGO: Durango, *Hitchcock* 7642.

AGUASCALIENTES: Aguascalientes, *Hitchcock* 7446.

SAN LUIS POTOSÍ: San Luis Potosí, *Schaffner* 175 (1057).

21. Aristida divaricata Humb. & Bonpl.

Aristida divaricata Humb. & Bonpl.; Willd. Enum. Pl. 1: 99. 1809. "Habitat in Mexico." In a later work[13] the original locality is given as "regione subfrigida regni Mexicani, inter Salamanca, Guanaxuato et Ovexeras." There is some confusion as to the species referred to by Willdenow. He cites "*Aristida divaricata* Humboldt et Bonpland" and gives the locality as Mexico. The description is short, but applies well enough to the Mexican species. But an appended note applies, according to Trinius and Ruprecht, to *A. jacquiniana* Tausch, which appears to have been growing in the Berlin Garden (see the following paragraph, under *A. humboldtiana*). I have assumed that the name is based on the Humboldt and Bonpland plant from Mexico rather than upon the garden plant. The type has been examined at Paris.

Chaetaria divaricata Beauv. Ess. Agrost. 30, 158. 1812. Based on *Aristida divaricata* Humb. & Bonpl.

Aristida humboldtiana Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 118. 1842. Based upon *A. divaricata* H. B. K., Humboldt and Bonpland's speci-

[13] H. B. K. Nov. Gen. & Sp. 1: 123. 1816.

men "inter Salamanca, Guanaxuato et Ovexeras" being cited. The authors think that *A. divaricata* Humb. & Bonpl. is the species afterwards described as *A. jacquiniana* Tausch (*A. divaricata* of Jacquin[14]) and hence change the name of *A. divaricata* H. B. K. to *A. humboldtiana*.

Aristida palmeri Vasey, Bull. Torrey Club **10**: 42. 1883. "Collected in southern Arizona in 1869 by Dr. E. Palmer." The type in the U. S. National Herbarium, marked no. 1, is a rather slender plant 35 cm. tall, with slender involute blades and an open panicle, 15 cm. long, the branches ascending or somewhat spreading but not strongly divaricate, the branchlets and pedicels mostly ascending rather than appressed; lemma with a twisted beak mostly longer than the glumes.

Aristida humboldtiana var. *minor* Vasey, Contr. U. S. Nat. Herb. **3**: 47. 1892. No specimens are cited, but the range is given as "Texas, Arizona, to California." Doctor Vasey wrote the name upon two sheets in the U. S. National Herbarium, one from Texas, collected by Nealley in 1887, and the other from California, collected by Hasse in 1890. The first is selected as the type. The specimens have short panicle branches, the lower being 5 to 7 cm. long, but do not differ from much of the material assigned to *A. divaricata*.

Aristida lemmoni Scribn. Trans. N. Y. Acad. Sci. **14**: 23. 1894. No specimen is cited, but the description is in a list of plants collected by T. E. Wilcox and others in southeastern Arizona. The type specimen, in the U. S. National Herbarium, was collected by Dr. T. E. Wilcox at Fort Huachuca in 1894. It closely resembles the type of *A. palmeri* Vasey. The slender twisted beak of the lemma exceeds the glumes.

DESCRIPTION.

Plants perennial; culms erect or often prostrate-spreading, glabrous or scaberulous, usually 30 to 60 cm. long, sometimes longer; sheaths glabrous, or scaberulous toward the summit, puberulent on each side of the collar and often villous at the throat; blades flat or usually loosely involute, or the basal closely involute, scabrous and strongly nerved on the upper surface, a few long weak hairs near the base, glabrous beneath, as much as 20 cm. long, mostly less than 3 mm. wide; panicles large and diffuse, usually as much as half the entire length of the culm, the branches spreading or deflexed, naked below, mostly in two's, scabrous, as much as 15 cm. long, branching two or three times, the ultimate branchlets and pedicels somewhat appressed; glumes nearly equal, scabrous on the keels, about 1 cm. long, the first acuminate, 1-nerved or obscurely 3-nerved, the second gradually narrowed into a short awn, 1-nerved; lemma about 1 cm. long, including the pubescent callus less than 1 mm. long, the upper part (about 2 mm.) narrowed into a scabrous, more or less twisted beak; sometimes longer, sometimes shorter than the glumes; awns about equal or the central a little longer, somewhat divergent, not twisted or warped at base, mostly 10 to 15 mm. long.

In aspect this species is rather variable, erect or usually prostrate, sometimes only 20 cm. long, the branches of the panicle at maturity always divaricately spreading but variable in length. The mature panicles become rather easily detached at maturity and are blown about by the wind. The beak of the mature lemma may be short and straight or rather long and twisted, and when twisted may be about as long as the glumes or exceeding them. A specimen collected by Orcutt on Hanson's Mountain in 1884 has the

[14] Jacq. Eclog. Gram. 7. *pl. 6.* 1814.

lateral awns only 1 to 3 mm. long, thus approaching *A. schiedeana*, but the stiffly divergent branches of the panicle are as in *A. divaricata*.

DISTRIBUTION.

Dry hills and plains, Kansas to southern California, south to Guatemala.

KANSAS: Haskell County, *Hitchcock* 591, 646. Meade County, *Carleton* 537.

TEXAS: El Paso, *Griffiths* 7433. Alpine, *Hitchcock* 13613. Limpia Mountains, *Havard* in 1881. Texline, *Griffiths* 5619, 5626. Burnet, *Plank* 27. Amarillo, *Hitchcock* 16216. Without locality, *Wright* 742. 2013; *Nealley* in 1887.

OKLAHOMA: Without locality, *Carleton* in 1891.

NEW MEXICO: Queen, *Hitchcock* 13528. East of Dona Ana Mountains, *Wooton & Standley* 3970. Deming, *Hitchcock* 3738. Black Range, *Metcalfe* 1494. El Caso, *Talbot* in 1915. Cimarron Canyon, *Griffiths* 5571. Gallinas Mountains, *Wooton* 2966. Without locality, *Fendler* 976; *Wright* 2012, 2013.

ARIZONA: Pedrogosa Mountains, *Mearns* 839. Santa Rita Mountains, *Griffiths & Thornber* 25, 296; *Shear* 1954; *Griffiths* 3417, 5970, 6979, 7269, 7270. Cottonwood, *Rothrock* (*Wheeler's Exped.*) 348. Fort Huachuca, *Wilcox* in 1894. South of Bisbee, *Mearns* 857. Camp Lowell, *Pringle* in 1881. Mescal. *Griffiths* 1816. Phoenix, *Griffiths* 7331. Show Low, *Wooton* in 1913. Empire Ranch, *Thornber* 28. Patagonia, *Hitchcock* 3701. Celero Mountains, *Griffiths* 6133. Tucson to Nogales, *Griffiths* 6743. Santa Catalina Mountains, *Griffiths* 7072. Canyon Padre, *Hitchcock* 13241. Oracle, *Hitchcock* 13259. Without locality, *Lemmon* 386; Palmer in 1869.

CALIFORNIA: Glenn County, *Heller* 11432. San Bernardino, *Parish* 1029. Pasadena, *Jones* 3216. San Jacinto, *Hasse* in 1892. Pedly, *Reed* 1128. Bakersfield, *Davy* 1895. Hansons Mountain, *Orcutt* in 1884.

LOWER CALIFORNIA: Santa Catalina Mountains, *Orcutt* in 1884.

SONORA: 10 miles south of Nogales, *Hitchcock* 3635. Nogales to Cocospora, *Griffiths* 6795.

CHIHUAHUA: Near White Water, *Mearns* 355. Sánchez, *Hitchcock* 7730. Chihuahua, *Hitchcock* 7785; *Pringle*, 387, 388. Miñaca, *Hitchcock* 7754, 7760, 7761.

SAN LUIS POTOSÍ: San Luis Potosí, *Hitchcock* 5687.

ZACATECAS: Zacatecas, *Hitchcock* 7517.

DURANGO: Durango, *Palmer* 873 in 1896, *Hitchcock* 7577.

JALISCO: Zapotlán, *Hitchcock* 7119. Guadalajara, *Hitchcock* 7280, 7299, 7308.

AGUASCALIENTES: Aguascalientes, *Hitchcock* 7448.

QUERÉTARO: Querétaro, *Basile* 29.

HIDALGO: Pachuca, *Hitchcock* 6717.

VERACRUZ: Jalapa, *Hitchcock* 6545.

PUEBLA: San Marcos, *Hitchcock* 6515, 6536. Chalchicomula, *Hitchcock* 6289, 6303. Esperanza, *Hitchcock* 6481. Puebla, *Arsène* 156, 238, 244, 247, 328, 1879.

MÉXICO: Toluca, *Hitchcock* 6894. Popo Park, *Hitchcock* 6028, 6029.

FEDERAL DISTRICT: *Pringle* 5204, 5907, 6408, 9576; *Orcutt* 3976; *Bourgeau* 677; *Arsène* 8877.

MICHOACÁN: Morelia, *Arsène* 2681.

OAXACA: Oaxaca, *Hitchcock* 6106, 6155.

GUATEMALA: Guatemala, *Hitchcock* 9027, 9038, 9086.

22. Aristida patula Chapm.

Aristida patula Chapm.; Nash, Bull. Torrey Club **23**: 98. 1896. Based on *Aristida scabra* Chapm.[15] In the U. S. National Herbarium is a specimen received from Chapman, collected in 1875, labeled "*Aristida patula* n. sp. S. Fl. ined.", which is probably a duplicate type. The lateral awns are about 7 mm. long.

DESCRIPTION.

Plants perennial; culms erect, cespitose, often loosely so, sometimes with short rhizomes, glabrous, as much as 1 meter tall; sheaths overlapping, glabrous, slightly villous at the throat; blades firm, flat, becoming involute, especially at the slender tip, scabrous on the upper surface, glabrous beneath, as much as 50 cm. long, mostly 2 to 4 mm. wide; panicles loose and open, one-third to half the entire length of the culm, the branches single or in pairs, distant, drooping, naked below, very scabrous, as much as 20 cm. long, branching at or above the middle, the spikelets on short pedicels appressed at the ends of the branchlets; glumes 12 to 15 mm. long, nearly equal, awn-pointed, 1-nerved, the first scabrous on the keel, the second smooth except at the summit of the keel; lemma 10 to 12 mm. long, glabrous, pubescent on the callus, scarcely beaked, the awns scabrous, scarcely diverging, the middle one straight, mostly 2 to 2.5 cm. long, the lateral scarcely diverging below, somewhat so above, mostly 5 to 10 mm. long.

DISTRIBUTION.

Moist sandy pine barrens, and low open ground, Florida.

FLORIDA: Indian River, *Curtiss* 3431*. Titusville, *Nash* 2295. Jupiter, *Curtiss* 5535. Manatee River, *Rugel* 380. Sanibel, *Hitchcock* in 1900. Homosassa, *Combs* 933. Grasmere, *Combs* 1149. Old Town, *Combs* 898. Ellzey, *Combs* 827. Cedar Key, *Combs* 779, 779a. Braidentown, *Combs* 1326. Arcadia, *Combs* 1275. Enterprise Junction, *Hood* 54. Cutler, *Small; Mosier & Small* 6725. Fort Myers, *Standley* 325; *Hitchcock* 445. Crocodile Hole, *Small & Small* 6833. Okeechobee region, *Fredholm* 5997. Miami, *Chase* 3841, 3868, 3887; *Tracy* 8855. Turkey Hammock, *Simpson* in 1890. Marco, *Hitchcock* in 1900. Tampa, *Garber* in 1877. Hernando County, *Hitchcock* 2272. Alapattah, *Eaton* 1278. Sneeds Island, *Tracy* 6456.

23. Aristida pansa Woot. & Standl.

Aristida pansa Woot. & Standl. Contr. U. S. Nat. Herb. **16**: 112. 1913. "Type in the U. S. National Herbarium, no. 690259, collected on Tortugas Mountain, Dona Ana County, October 6, 1904, by E. O. Wooton."

DESCRIPTION.

Plants perennial; culms stiffly erect, slender and wiry, minutely scaberulous or puberulous, 20 to 40 cm. tall; sheaths minutely puberulous, at least between the nerves, densely short-villous at the throat and pubescent on the collar; blades closely involute, more or less flexuous, scabrous, puberulent on the upper surface, glabrous beneath, as much as 15 mm. long, usually less, about 0.5 mm. thick when rolled; panicles narrow, open, rather stiffly upright,

[15] Fl. South. U. S. 663. 1884. Chapman misapplies the name, as he credits it to Kunth.

10 to 20 cm. long, the axis scaberulous, the branches stiffly ascending, 4 to 8 cm. long, single or with a basal shorter branch or a single spikelet, the spikelets appressed toward the summit of the branches; glumes unequal, 1-nerved, acuminate or awn-pointed, the first minutely scaberulous on the keel, 5 to 7 mm. long, the second smooth on the keel, 7 to 10 mm. long, lemma about as long as the second glume, sometimes a little longer, short-pilose on the 1 mm. long callus, smooth on the lower part, scaberulous above and gradually narrowed into a scabrous slightly twisted beak of about 2 mm., the whole 7 to 10 mm. long; awns about equal, divergent or finally nearly horizontally spreading, 10 to 20 mm. long, the bases finally somewhat curved or warped.

This species differs from *A. havardii* in the stiff branches and appressed pedicels, and from *A. divaricata* in the short branches of the panicle, and from both in the unequal glumes.

DISTRIBUTION.

Plains and open ground, western Texas to Arizona.

TEXAS: Marfa, *Havard* 29 in 1883. Sierra Blanca, *Rose & Fitch* 17942. Fort Stockton, *Wooton* in 1913. El Paso, *Griffiths* 7432; *Plank* 64. Pecos River, *Havard* 62 in 1881. Without locality, *Nealley* in 1887.

NEW MEXICO: Tortugas Mountains, *Wooton* in 1904. Little Mountain, *Wooton* in 1904. Albuquerque, *Rose & Fitch* 17818. Las Cruces, *Griffiths* 7414, 7417. Jornada Range Reserve, *Wooton* in 1912. Lake Valley, *Beals* in 1914.

ARIZONA: Grand Canyon, *Hitchcock* 13068. Without locality, *Lemmon* 388.

24. Aristida spadicea H. B. K.

Aristida spadicea H. B. K. Nov. Gen. & Sp. 1: 123. 1816. "Crescit locis apricis, subfrigidis juxta Guanaxuato et Mina de Belgrado," Mexico, and also on the Orinoco near Carichana and "in inundatis fluminis Guayaquilensis." The Orinoco and Guayaquil specimens are in the Paris Herbarium. In the segregated H. B. K. Herbarium in the same herbarium is a specimen without data, but bearing the name in Kunth's handwriting. This is doubtless the Mexican specimen. In this and in the Orinoco specimen the lateral awns are about half as long as the middle one; in the Guayaquil specimen they are shorter.

Chactaria spadicea Roem. & Schult. Syst. Veg. 2: 397. 1817. Based on *Aristida spadicea* H. B. K.

Aristida longiramea Presl, Rel. Haenk. 1: 224. 1830. "Hab. in Mexico." The type is in the herbarium of the German University at Prague. The locality is not indicated.

Aristida karwinskiana Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 121. 1842. "Mexico (*L. B. Karwinsky*)." The type, from Zuccarini, in the Trinius Herbarium, is labeled "in Imperio Mexicano, Karwinski." The lateral awns are 2 to 6 mm. long and the glumes about 8 mm. long.

In a preceding work (Contr. U. S. Nat. Herb. 17: 279. 1913) I applied the name *A. spadicea* to what is called in this revision *A. arizonica*.

DESCRIPTION.

Plants perennial; culms cespitose, erect, glabrous, as much as 1 meter tall; sheaths glabrous; ligule very short, less than 0.5 mm. long; blades flat, the old ones curled or flexuous, becoming involute, narrowed into a filiform tip,

scaberulous on the upper surface, glabrous beneath, as much as 40 cm. long, 1 to 2 mm. wide; panicle large and open, 15 to 30 cm. long, the axis scabrous or the lower internode nearly glabrous, the branches few and distant, mostly solitary, as much as 15 cm. long, naked below, drooping, very scabrous, branched at or above the middle, the spikelets appressed along the upper part of the branches and branchlets; glumes about equal or the first a little shorter, 8 to 12 mm. long, awn-pointed, the first 1-nerved or with 1 or 2 lateral nerves, scabrous on the keel and often on the lateral nerves, the second 1-nerved, glabrous; lemma mostly longer than the glumes, 10 to 15 mm. long, including the twisted beak 3 to 5 mm. long, pubescent on the callus; awns about equal or the lateral shorter, sometimes only half as long, only slightly divergent, the central 10 to 15 mm. long.

DISTRIBUTION.

Prairies and sterile hills, Mexico to northern South America.

JALISCO: Guadalajara, *Hitchcock* 7274, 7275. Río Blanco, *Palmer* 284, 476, 768, 768a in 1886. Zapotlan, *Hitchcock* 7112. San Nicolás, *Hitchcock* 7227, 7233.

PUEBLA: Tochimilco, *Nelson* in 1893. Puebla, *Arsène* 302, 1602, 1627.

FEDERAL DISTRICT: *Pringle* 6493, 6544; *Hitchcock* 5960.

MICHOACÁN: Morelia, *Arsène* 2432, 2474, 2594a, 2629, 2647, 2652, 2922, 5113.

BRITISH HONDURAS: *Peck* 72 (Gray Herb.).

COLOMBIA: Bogotá, *Pennell* 2182.

25. Aristida spiciformis Ell.

Aristida spiciformis Ell. Bot. S. C. & Ga. **1**: 141. 1816. "Grows in wet pine barrens," presumably in the vicinity of Charleston.

Aristida stricta Muhl. Descr. Gram. 174. 1817. Not *A. stricta* Michx. 1803. "Habitat in Georgia." No mention of this species is made by Scribner and Merrill in their account of the grasses of the Muhlenberg Herbarium.[16] Muhlenberg's description leaves no doubt as to the identity, as he mentions the awned glumes and the long column.

Aristida squarrosa Trin. in Spreng. Neu. Entd. **2**: 62. 1821. "Hab. in America boreali." The type in the Trinius Herbarium, was sent from Vienna under the name of *A. oligantha* Michx. The locality other than "Am. bor." is not given.

Chaetaria squarrosa Schult. Mant. **3**: 577. 1827. Based on *Aristida squarrosa* Trin.

DESCRIPTION.

Plants perennial; culms cespitose, strictly erect, glabrous, 50 to 100 cm. tall; sheaths glabrous, sometimes slightly villous at the throat; blades erect, flat, or usually inrolled or tightly involute, scabrous or scabrous-pubescent on the upper surface, glabrous beneath, as much as 30 cm. long, 1 to 3 mm. wide; panicle erect, dense and spikelike, mostly 10 to 15 cm. long, the branches short and appressed, the whole panicle more or less spirally twisted; glumes unequal, 1-nerved, abruptly long-awned, the first about 4 mm. long, scabrous on the keel, the awn usually 10 to 12 mm., sometimes only 5 mm. long; the second 8 to 10 mm. long, nearly smooth, the awn usually 10 to 12 mm., sometimes only 7 mm. long; lemma 5 to 6 mm. long including the sharp densely

[16] U. S. Dept. Agr. Div. Agrost. Circ. **27**. 1900.

short-pubescent 2 mm. long callus, extending upward into a slender twisted column 1 to 3 cm. long, sometimes only 7 mm. long; awns about equal, 2 to 3 cm. long, divergent or horizontally spreading, more or less curved or warped at base.

DISTRIBUTION.

Pine barrens along the coast, South Carolina to Florida and Texas; also in Cuba and Porto Rico.

SOUTH CAROLINA: Beaufort, *Mellichamp* in 1882.
GEORGIA: Camp Cornelia, *Ricker* 935. Coffee County, *Harper* 686.
FLORIDA: Lake City, *Bitting* 868. Palm Beach, *Hitchcock* 2277. Sanford, *Pieters* 310. Fort Myers, *Standley* 362; *Hitchcock* 442, 871. Okeechobee region, *Fredholm* 5995. Grasmere, *Combs* 1115. Apalachicola, *Biltmore Herb.* 1121b; *Kearney* 122. Santa Rosa, *Combs* 499. Bartow, *Combs* 1200. Braidentown, *Combs* 1315. Cedar Key, *Combs* 784. Citrus, *Combs* 951. Lake City, *Combs* 111. Fellsmere, *Tracy* 9255. Waldo, *Combs* 696. Palma Sola, *Tracy* 6510. Tampa, *Nash* 2418; *Combs* 1349. Eustis, *Nash* 1689. Jacksonville, *Curtiss* 3427, 4047. Jensen, *Hitchcock* 731. Marco, *Hitchcock* in 1900. Orange Glade, *Eaton* 586. Titusville, *Chase* 3985 Osceola County, *Fredholm* 6082. Without locality, *Rugel* 305, 537.
ALABAMA: Mobile, *Mohr* in 1879.
MISSISSIPPI: Horn Island, *Tracy* in 1875.
TEXAS: Rio San Pedro, *Thurber* in 1850.
CUBA: Isle of Pines, *Britton, Britton & Wilson* 14198.
PORTO RICO: Campo Alegre, white sand barren, *Chase* 6614.

26. Aristida implexa Trin.

Aristida implexa Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 2[1]: 48. 1836. "V. spp. Bras." The type specimen in the Trinius Herbarium at the Academy of Sciences, Petrograd, was collected by Riedel at Itapetininga, São Paulo, Brazil, "in campis siccis." The twisted column is about 6 cm. long and the central awn 4.5 cm. long, the lateral ones 2.5 cm. long.

Aristida implexa β aequa Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 124. 1842. "In graminosis siccis Serra da Chapada." The type, in the Trinius Herbarium, has a column about 2.5 cm. long, the equal awns about 5 cm. long.

Aristida paraguayensis Lindm. Svensk. Akad. Handb. 34[6]: 14. *pl.* 7. *f. B.* 1900. "Hab. in Paraguay, in colle saxoso Cerro Perou prope Paraguari, *Balansa* 187." The type was examined in the herbarium at Stockholm.

Specimens of *A. implexa* have been distributed with the name *A. megapotamica* Spreng.[17] The type specimen of this, in the Berlin Herbarium, collected by Sello in Rio Grande do Sul, Brazil, is a species of *Stipa*. Sprengel's description indicates a species of *Stipa* rather than of *Aristida*, "arista corillae longissima patula scabra." Doell[18] refers this to *Stipa filifolia* Nees.

DESCRIPTION.

Plants perennial; culms cespitose, erect, glabrous, 30 to 50 cm. tall or even as much as 1 meter; sheaths numerous and overlapping at the base of the plant, glabrous; blades flat at base becoming involute toward the fine tip, as

[17] Syst. Veg. Cur. Post 31. 1827. [18] Mart. Fl. Bras. 2[3]: 25. 1878.

much as 35 cm. long, the basal as much as 3 mm. wide, the upper narrower and more involute, glabrous beneath, finely scaberulous-pubescent on the upper surface; panicle dense and spikelike, 10 to 20 cm. long, the branches short and appressed, 5 to 10 mm. long, the ultimate pedicels 1 to 2 mm. long, the axis angular, scaberulous; first glume about 15 mm. long, 1-nerved, lateral nerves sometimes present, scabrous on the keel and faintly scaberulous on the back, tipped with a straight awn about 5 mm. long; second glume 10 to 12 mm. long, glabrous on back and keel, the awn 2 to 3 mm. long; lemma about 7 mm. long, including the 1 mm. long pubescent callus, glabrous, the column strongly twisted, scaberulous, 2 to 2.5 cm. long; awns about equal, divergent, about 3 cm. long, or in Paraguayan specimens as much as 5 cm. long.

This species is closely related to *A. chapadensis* Trin. The latter has looser more open panicle and shorter column and for the present is ranked as a distinct species.

DISTRIBUTION.

Plains and rocky slopes, Panama to Paraguay.

SALVADOR: Cerra de la Olla, *Calderón* 1054.

PANAMA: Cerro Vaca, eastern Chiriquí, in savannas, at 900 to 1,136 meters altitude, *Pittier* 4350.

BRAZIL: Crux Alta, Rio Grande do Sul, *Jürgens* 249. Curvalho, Minas Geraes, *Lund* in 1835. Pinhaes, Paraná, *Dusén* 7764. Desvio, Paraná, *Dusén* 7619. Minas Geraes, *Regnell* III. 1397. Barreiras, Bahia, *Jard. Bot. Rio de Janeiro* 5541. Without locality, *Glaziou* 15624.

PARAGUAY: Central Paraguay, *Morong* 488. Northern Paraguay, *Fiebrig* 5189; *Hassler* 10354, 12010.

ARGENTINA: Posadas, Misiones, *Ekman* 687.

27. **Aristida glauca** (Nees) Walp.

Chaetaria glauca Nees. Linnaea **19:** 688. 1847. "Mexico. Aschenb. exs. n. 251." The type, with the name in Nees's script, was examined in the Berlin Herbarium. The awns are about 2 cm. long.

Aristida glauca Walp. Ann. **1:** 925. 1849. Based on *Chaetaria glauca* Nees.

Aristida reverchoni Vasey, Bull. Torrey Club **13:** 52. 1886. "Collected by Reverchon on rocky hills in Crocket [Crockett] County, Texas." The type, in the U. S. National Herbarium, is labeled in Vasey's hand, "Aristida Reverchoni Vasey. 18. Texas. *J. Reverchon*, 1885." The awns are about 2.5 cm. long, and the spikelets somewhat larger than in the type of *A. glauca*, the panicles few-flowered and somewhat interrupted.

Aristida stricta var. *nealleyi* Vasey, Contr. U. S. Nat. Herb. **1:** 55. 1890. "Chenate Mountains (Presidio County)." This was included (no. 709) in a list of plants collected in Texas by G. C. Nealley. The type is in the U. S. National Herbarium, the name in Vasey's hand, afterwards changed by him to *A. nealleyi*. The awns are only about 1.5 cm. long and the spikelets are somewhat smaller, as in the type of *A. glauca*.

Aristida nealleyi Vasey, Contr. U. S. Nat. Herb. **3:** 45. 1892. Based on *Aristida stricta nealleyi* Vasey.

Aristida reverchoni var. *augusta* [*angusta*] Vasey, Contr. U. S. Nat. Herb. **3:** 46. 1892. "Comanche Peak (*Reverchon*), Texas (*G. C. Nealley*)." The first specimen cited is selected as the type. The name is in Vasey's hand. The specimen (no. 10) was collected at Comanche Peak, Texas, September, 1881, by J. Reverchon. The panicle is past maturity. The awns are as much as 2 cm. long.

Aristida vaseyi Woot. & Standl. N. Mex. Coll. Agr. Bull. **81**: 55. 1912; Contr. U. S. Nat. Herb. **16**: 113. 1913. In the bulletin cited first, the species is characterized in a key to the species of *Aristida* in New Mexico, but no synonym is cited. In the second work cited there is a full description and *Aristida reverchoni augusta* Vasey is given as a synonym.

DESCRIPTION.

Plants perennial; culms cespitose, erect, glabrous, 20 to 40 cm. tall; sheaths glabrous, sparsely villous at the throat, especially on the innovations; blades involute, mostly curved or flexuous, scabrous on the upper surface, glabrous beneath, mostly 5 to 10 cm. long, about 1 mm. wide; panicle narrow, erect, rather few-flowered, mostly 8 to 15 cm. long, the branches stiffly appressed, bearing 1 to few spikelets; glumes unequal, 1-nerved, more or less mucronate or awn-pointed, the first scabrous on the keel, 5 to 8 mm. long, the second glabrous, usually about twice as long, sometimes only one and a half times as long; lemma 10 to 12 mm. long, the callus pubescent, 0.5 mm. long, the body glabrous, tapering into a minutely scabrous, slender, somewhat twisted beak about half the total length of the lemma; awns about equal, scabrous, nearly glabrous at the flat, slightly contorted base, divergent or nearly horizontally spreading, 1.5 to 2.5 cm. long.

The material of this species now at hand is much more ample than that available to Vasey and shows that the three types described by him are forms of a single somewhat variable species.

DISTRIBUTION.

Dry or rocky hills and plains, Texas to southern California and south to Puebla.

TEXAS: Big Spring, *Hitchcock* 13373. El Paso, *Vasey* in 1881; *Griffiths* 7430; *Plank* 85; *Jones* in 1884; *Hitchcock* 13422, 13427, 13438. Kerrville, *Smith* in 1897; *Hitchcock* 5302. Cherry Springs, *Jermy* 541. Pecos, *Hanson* 783. Dallas, *Bebb* 1295. Crockett County, *Reverchon* 1237. San Angelo, *Smith* in 1897; *Reverchon* 4122. Comanche Peak, *Reverchon* in 1881, 3426a. Langtry, *Nealley* 116, 117. Alpine, *Hitchcock* 13589. Eagle Mountains, *Havard* in 1881. San Antonio, *Hitchcock* 5340. Chenate Mountains, *Nealley* 709.

UTAH: La Verken, *Jones* 5183.

NEVADA: Horse Spring, *Jones* 5069g. St. Thomas, *Tidestrom* 9091. Bunkerville, *Goodding* 754.

NEW MEXICO: Las Cruces, *Griffiths* 7128, 7416. Jornada Range Reserve, *Wooton* 7070. Queen, *Hitchcock* 13508. Pena Blanca, *Standley* in 1906. Alamagorda, *Hitchcock* 2542. Tortugas Mountain, *Wooton* in 1904; *Standley* 6455. Bishops Cap, *Standley* in 1906. Socorro, *Plank* 56. Mangas, *Metcalfe* in 1897. Lake Valley, *Beals* in 1914. Without locality, *Wright* 2002.

ARIZONA: Phoenix, *Toumey* 158. Bright Angel Trail, Grand Canyon, *Hitchcock* 13067; *MacDougal* 229. Jerome Junction, *Tidestrom* 923a. Kingman, *Wooton* in 1911. Tucson, *Hitchcock* 13669. Santa Rita Mountains, *Griffiths* 7190. Fort Huachuca, *Wilcox* in 1894. Apache Smelter, *Griffiths* 7124. Without locality, *Rothrock* 481.

CALIFORNIA: Needles, *Jones* 3833. Newberry, *Chase* 5788. Funeral Mountains, *Jepson* 6907. Cottonwood Springs, *Parish* 10850. Palm Springs, *Reed* 1010, 4316.

COAHUILA: Saltillo, *Hitchcock* 5618; *Palmer* in 1898.

CHIHUAHUA: Santa Eulalia Mountains, *Pringle* 389.
NUEVO LEÓN: Monterrey, *Hitchcock* 5520.
ZACATECAS: Hacienda de Cedros, *Lloyd* 195.
PUEBLA: Esperanza, *Hitchcock* 6492. Tehuacán, *Pringle* 7535.

28. Aristida purpurea Nutt.

Aristida purpurea Nutt. Trans. Amer. Phil. Soc. II. 5: 145. 1837. "On the grassy plains of Red River, in arid situations." in the southwest corner of Arkansas. The type is in the Academy of Natural Sciences, Philadelphia. The spikelets of the type are described by Merrill,[19] from a fragment in the U. S. National Herbarium. The awns are 3.5 to 4.5 cm. long; any shorter ones appear to be broken.

Aristida purpurea γ. hookeri Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 107. 1842. "Texas (a *Drummond*. n. 293. lect. com. ill. Hooker)." The type, in the Trinius Herbarium, is labeled, "Texas II 293 [plants thus labeled are collected by Drummond] Hooker 1836." This is the typical form of *A. purpurea.*

Aristida purpurea β. berlandieri Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 107. 1842. "Texas pr. Bejar. (*Berland*. n. 1777.)" The type, in the Trinius Herbarium, has lemmas 1 cm. long and awns 3 cm. long.

Aristida aequiramea Scheele, Linnaea 22: 343. 1849. Described in an article on the flora of Texas. "Neubraunfels . . . *Lindheimer*." The type has not been examined, but a specimen of the type collection, Lindheimer's no. 562, collected at New Braunfels, September 1846,[20] is in the U. S. National Herbarium.

Aristida curtiseta Buckl. Proc. Acad. Phila. 1862: 92. 1863. "Northern Texas." Merrill[21] states that the type, in the Philadelphia Academy, is a specimen with spikelets "aborted by a species of Ustilago. It is probably *Aristida purpurea* Nutt., or some closely related form."

Aristida filipendula Buckl. Proc. Acad. Phila. 1862: 93. 1863. "Western Texas." Merrill states[22] that Lindheimer's no. 562 in the Philadelphia Academy is named "*Aristida filipendula*" by Buckley and that it is identical with this number in the U. S. National Herbarium. (See *A. aequiramea* above.)

Aristida purpurea var. *californica* Vasey, Contr. U. S. Nat. Herb. 3: 47. 1892. "Western Texas to California." The specimen upon which Vasey has written the name is *Lemmon* 5474, from Capay Valley, Yolo County, California.

Aristida fasciculata var. *californica* Beal, Grasses N. Amer. 2: 207. 1896. Based on *A. purpurea californica* Vasey.

Aristida fasciculata var. *hookeri* Beal, Grasses N. Amer. 2: 207. 1896. Based on *A. purpurea hookeri* Trin. & Rupr.

Aristida purpurea aequiramea Merr. U. S. Dept. Agr. Div. Agrost Circ. 34: 7. 1901. Based on *A. aequiramea* Scheele.

Aristida longiseta hookeri Merr. U. S. Dept. Agr. Div. Agrost. Circ. 34: 5. 1901. Based on *A. purpurea hookeri* Trin. & Rupr.

Aristida purpurea capillarifolia Merr. U. S. Dept. Agr. Div. Agrost. Circ. 34: 8. 1901. "Type specimen collected in Texas by G. C. Nealley. No locality given." The type is in the U. S. National Herbarium. It differs from the

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[19] U. S. Dept. Agr. Div. Agrost. Circ. 34: 6. 1901.
[20] See Ann. Rep. Mo. Bot. Gard. 18: 151. 1907.
[21] U. S. Dept. Agr. Div. Agrost. Circ. 34: 8. 1901.
[22] U. S. Dept. Agr. Div. Agrost. Circ. 34: 7. 1901.

ordinary form of *A. purpurea* only in the elongate blades, these as much as 30 cm. long.

Aristida berlandieri Hitchc. Contr. U. S. Nat. Herb. 17: 280. 1913. Based on *A. purpurea berlandieri* Trin. & Rupr.

DESCRIPTION.

Plants perennial, often in large tufts, the innovations usually numerous, forming a basal cushion; culms cespitose, erect, or somewhat decumbent at base in the outer part of the tuft, glabrous, mostly 30 to 50 cm. tall; sheaths glabrous or the lower somewhat scaberulous, villous at the throat; blades usually involute, scabrous on the upper surface, glabrous or sometimes scaberulous beneath, usually less than 10 cm. long, 1 to 1.5 mm. wide; panicles narrow, nodding, rather lax and loose, usually purplish, 10 to 20 cm. long, the branches and longer pedicels capillary, more or less curved or flexuous, as much as 5 cm. long, some of these naked for 1 to 2 cm. at base; glumes unequal, 1-nerved, acuminate and bearing an awn 1 to 2 mm. long, this often between 2 slender thin teeth, the first 6 to 8 mm. long, scabrous on the keel, the second glabrous, about twice as long as the first; lemma about 1 cm. long, the callus less than 1 mm. long, short-pilose, the body gradually tapering to the scarcely beaked summit, tuberculate-scabrous in lines from below the middle to the summit, the background usually purplish, the raised parts whitish; awns nearly equal, very slender, nearly smooth at the scarcely contorted base, scabrous above, finally widely spreading, mostly 3 to 5 cm. long.

DISTRIBUTION.

Dry hills and plains, Kansas to southern California, south to northern Mexico.

KANSAS: Liberal, *Rose & Fitch* 17142. Fort Dodge, *Griffiths* 6555.

TEXAS: Sarita, *Hitchcock* 5441, 5443, 5482. El Sordo, *Griffiths* 6437, 6438. Dallas, *Bush* 634, 665; *Bebb* 1295, 2488; *Reverchon* 1062, 1877, 3423*, 4203A, 4264. Abilene, *Tracy* 7933. Estelline, *Reverchon* 4121. Magenta, *Ball* 1650. Fort Stockton, *Ball* 1510, 1514. Junction, *Ball* 1534. Texline, *Griffiths* 5648. Kent, *Tracy & Earle* 372. Bracket, *Canby* 267. Devils River, *Orcutt* 6018. Big Spring, *Hitchcock* 13363. Midland, *Tracy* 7932. Robstown, *Hitchcock* 5390. Tarrant County, *Ruth* 169. Austin, *Hall* 767, 768. New Braunfels, *Hitchcock* 5209, 5210; *Lindheimer* 562. San Antonio, *Hitchcock* 5137, 5186, 5191, 5494; *Ball* 930; *Lindheimer* 563. Corpus Christi, *Hitchcock* 5351; *Orcutt* 5909. Kingsville, *Tracy* 8906. Colorado, *Tracy* 7930. Spofford, *Griffiths* 6299. Without locality, *Nealley* in 1887; *Palmer* 1350; *Wright; Buckley* in 1883; *Berlandier* 949; *Reverchon* 1061. Laredo, *Reverchon* 4125A; *Nealley* 104. Gregory, *Heller* 1579. El Paso, *Griffiths* 7435; *Hitchcock* 5913. Alpine, *Hitchcock* 13590. Sanford, *Griffiths* 6257. Limpia Canyon, *Nealley* 146. Bracken, *Groth* 164. Colorado, *Tracy* 7930. Isabel, *Hitchcock* 5432. Minerva, *Reverchon* 4126. Bejar, *Berlandier* 1777.

OKLAHOMA: "Indian Territory," *Sheldon* in 1891. Alva, *Stevens* 552. Altus, *Stevens* 1181. Limestone Gap, *Butler* in 1877. False Washita, *Palmer* 389. Pearsall, *Griffiths* 6547.

COLORADO: Colorado Springs, *Griffiths* 6706.

UTAH: St. George, *Hall* 558.

NEW MEXICO: Roswell, *Griffiths* 4248, 5689, 5752. Las Cruces, *Wooton* 3102. Socorro, *Plank* 90. Carlsbad, *Hitchcock* 13463. Mesilla Valley, *Standley* in 1906. Albuquerque, *Griffiths* 7394. Without locality, *Wright* 2004.

ARIZONA: Santa Catalina Mountains, *Griffiths* 7125. Santa Rita Mountains, *Griffiths & Thornber* 310. Tucson, *Tourney* 808. La Noria, *Mearns* 1203. Santa Rosa, *Griffiths* 4044. Flagstaff, *Griffiths* 4965. Camp Lowell, *Pringle* in 1881. Oracle, *Hitchcock* 13260, 13263. Dos Cabezas, *MacDougal* 776. Patagonia, *Hitchcock* 3703.

CALIFORNIA: Banning, *Griffiths* 8007. Rialto, *Parish* in 1893. San Bernandino, *Parish* 2123, 3668. Fall Brook, *Parish* 2242. San Jacinto, *Parish Brothers* 1549. Juniper Hills, *Wilder* 1047. Avondale, *Reed* 1129. Needles, *Jones* in 1884. Mentone, *Leiberg* 3295.

COAHUILA: Saltillo, *Palmer* 392 in 1898; *Hitchcock* 5616.

SAN LUIS POTOSÍ: San Mateo, *Griffiths* 8028.

28a. **Aristida purpurea micrantha** Vasey.

Aristida roemeriana Scheele, Linnaea **32:** 343. 1849. "Prope Neubraunfels leg. Römer." The type has not been examined. The description shows that the plant belongs to the *purpurea* group. The lemma is described as "subulatus glaber 4-lineatus gluma superiori brevior." This indicates *A. purpurea micrantha.*

Aristida muhlenbergioides Fourn. Mex. Pl. **2:** 79. 1886. "San Luis de Potosi (*Virl.* n. 1424); Cañon de las Minas (*Karw.* n. 1008)." The Karwinsky specimen has been examined at the herbarium of the St. Petersburg Botanical Garden, a fragment being in the U. S. National Herbarium. The Virlet specimen has been examined at Paris. The name appeared without description in the Biologia.[23]

Aristida purpurea var. *micrantha* Vasey, Contr. U. S. Nat. Herb. **3:** 47. 1892. "Western Texas." The selected type is a specimen collected in Texas by C. G. Nealley, upon which Vasey has written the name.

Aristida fasciculata var. *micrantha* Vasey; Beal, Grasses N. Amer. **2:** 207. 1896. Based on *A. purpurea micrantha* Vasey.

Aristida micrantha Nash in Small, Fl. Southeast. U. S. 117. 1903. Based on *A. purpurea micrantha* Vasey.

DESCRIPTION.

Plants perennial; culms cespitose, erect, slender, glabrous, 30 to 50 cm. tall; sheaths glabrous or minutely roughened, naked or sparsely villous at the throat; blades flat or involute, scrabrous on the upper surface, glabrous or minutely roughened beneath, mostly less than 10 cm. long, about 1 mm. wide; panicle narrow, lax, usually pale, 10 to 20 cm. long, the branches curved or flexuous, capillary, with short ones intermixed, several-flowered; glumes unequal, acuminate, 1-nerved, the first 4 to 5 mm. long, scabrous on the keel, the second about twice as long, glabrous; lemma 7 to 8 mm. long, the callus 0.5 mm. long, pubescent, the body glabrous, narrowed into a slightly scaberulous beak; awns about equal, slender, divergent, somewhat contorted at base, about 2 cm. long.

DISTRIBUTION.

Plains and rocky hills, Texas to northern Mexico.

TEXAS: Del Rio, *Hitchcock* 13625, 13638½; *Plank* 82; *Wooton* in 1913. Spofford, *Griffiths* 6295. Corpus Christi, *Ravenel* in 1869. Pearsall, *Griffiths* 6548. San Diego, *Smith* in 1899. Big Spring, *Hitchcock* 13342, 13378. *Encinal, Griffiths* 7934. Kingsville, *Tracy* 8897. Boquillas, *Bailey* 341. Without locality, *Nealley* in 1888 and 1889; *Buckley* in 1883; *Wright* 743.

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[23] Biol. Centr. Amer. Bot. **3:** 534. 1885.

NEW MEXICO: Carlsbad, *Hitchcock* 13481.
COAHUILA: Saltillo, *Palmer* 1351 in 1880; *Hitchcock* 5616.
NUEVO LEÓN: Monterrey, *Hitchcock* 5526, 5567.
TAMAULIPAS: Victoria, *Palmer* 429 in 1907. Buena Vista, *Wooton* in 1919.
SAN LUIS POTOSÍ: Micos, *Pringle* 3790.

28b. Aristida purpurea laxiflora Merr.

Aristida purpurea laxiflora Merr. U. S. Dept. Agr. Div. Agrost. Circ. **34**: 8. 1901. "Type specimen collected in Texas, no locality, No. 12, *J. Reverchon*, May, 1881," is in the U. S. National Herbarium.

DESCRIPTION.

Differs from the species in the few-flowered panicle, the branches capillary and flexuous, bearing 1 or 2 spikelets.

DISTRIBUTION.

Dry plains, Texas to Arizona.

TEXAS: Dallas, *Reverchon* 3481A, 4203. Without locality, *Nealley* in 1887.
NEW MEXICO: Carlsbad, *Hitchcock* 13496. Hope, *Wooton* in 1905.
ARIZONA: Cochise, *Griffiths* 1880.

29. Aristida curvifolia Fourn.

Aristida curvifolia Fourn. Mex. Pl. **2**: 78. 1886. "Inter La Noria del Viejo et Tanquecillos (*Karw.* n. 1007); San Luis de Potosi (*Virl.* n. 1449)." Both specimens are in the Paris Herbarium.

DESCRIPTION.

Plants perennial; culms erect, wiry, cespitose, glabrous, 20 to 40 cm. tall; sheaths glabrous, villous at the throat; blades involute, firm, glabrous on the outer side, 5 to 20 cm. long, usually curved or flexuous; panicle erect, narrow, 5 to 15 cm. long, the branches appressed; glumes unequal, rather broad, obtuse and somewhat mucronate, or slightly lobed at summit, glabrous, rather firm, the first about 8 mm. long, the second 2 or 3 mm. longer; lemma about 1 cm. long, scaberulous on the narrowed slightly twisted summit; awns equal, spreading, somewhat warped at base, 10 to 15 mm. long.

The specimens cited below have a shorter and more slender lemma than the specimens mentioned by Fournier, and may belong to a different species.

DISTRIBUTION.

Dry ground, northern Mexico.

NUEVO LEÓN: Monterrey, *Hitchcock* 5566.
SAN LUIS POTOSÍ: Minas de San Rafael, *Purpus* 5010.

30. Aristida wrightii Nash.

Aristida wrightii Nash in Small, Fl. Southeast. U. S. 116. 1903. On page 1327: "Type, Dallas, Tex., *Reverchon*, no. 1061, in Herb. Nash." This specimen, now in the herbarium of the New York Botanical Garden, was kindly lent by Dr. Britton.

DESCRIPTION.

Plants perennial; culms cespitose, erect, glabrous, 30 to 60 cm. tall or sometimes taller; sheaths glabrous or sometimes on the innovations scaberulous,

villous at the throat and usually with a more or less hispid or villous line across the collar; blades involute, curved or flexuous, scabrous on the upper surface, glabrous or sometimes scaberulous beneath, 10 to 20 cm. long, about 1 mm. wide; panicle erect, narrow, 15 to 20 cm. long, the rather distant branches appressed or ascending, as much as 6 cm. long, several-flowered, the lower sometimes somewhat flexuous; glumes unequal, 1-nerved, acuminate or mucronate but scarcely awn-tipped, the first 6 to 7 mm. long, scabrous on the keel, the second about twice as long, glabrous; lemma 10 to 12 mm. long, the callus about 1 mm. long, pubescent, the body glabrous below, gradually narrowed toward the summit, scaberulous on the upper half; awns nearly equal, about 2 cm. long, divergent, sometimes nearly horizontally spreading, somewhat contorted at base.

DISTRIBUTION.

Dry plains and hills, Texas to southern California and central Mexico.

TEXAS: El Paso, *Hitchcock* 7810, 13318, 13437, 13439; *Chase* 5895, 5910, 5912, 5913, 5914, 5917½; *Griffiths* 7431; *Rose & Fitch* 17844. Kerrville, *Hitchcock* 5277. Dallas, *Reverchon* 769, 1409. Fort Worth, *Ruth* 169. Kent, *Tracy & Earle* 416. Weatherford, *Tracy* 7929. Alpine, *Hitchcock* 13619. Big Spring, *Hitchcock* 13345, 13351, 13419; *Havard* 60. Sterling, *Hitchcock* 13388. Spofford, *Griffiths* 6296. Cherry Spring, *Jermy* 531. Fort Stockton, *Ball* 1511. Fort McKavett, *Ball* 1549. Estelline, *Reverchon* 4120. Amarillo, *Hitchcock* 16184. Plains west of Pecos, *Tracy & Earle* 414. Limpia Canyon, *Nealley* 146. Without locality, *Nealley* 330; *Wright* 739.

COLORADO: Canyon City, *Tracy* 477.

UTAH: St. George, *Goodding* 812.

NEW MEXICO: Carlsbad, *Hitchcock* 13479. Artesia, *Hitchcock* 13456, 13457. West of Guadalupe Mountains, *Hitchcock* 13565. Las Cruces, *Griffiths* 7413. Roswell, *Griffiths* 5722. Cimarron Canyon, *Griffiths* 5576. Organ Mountains, *Wooton* in 1904; *Hitchcock* 3803. Deming, *Hitchcock* 3746. Without locality, *Wright* 2003, 2015.

ARIZONA: Washingtons Face, *Griffiths* 2480. Camp Grant, *Rothrock* 374. Phoenix, *Dewey* in 1891.

CALIFORNIA: Split Mountain, Colorado Desert, *Parish* 9121.

COAHUILA: Saltillo, *Palmer* 265 in 1898.

SAN LUIS POTOSÍ: Cárdenas, *Hitchcock* 5724.

PUEBLA: Tehuacán, *Pringle* 8556.

31. Aristida eggersii Hitchc., sp. nov.

DESCRIPTION.

Plants perennial; culms cespitose, slender, spreading or decumbent at base, glabrous, 20 to 40 cm. tall; sheaths glabrous or minutely scaberulous, minutely pilose around the throat and hispidulous in a line across the collar; ligule a very short ciliate membrane; blades involute, scaberulous on the upper surface, glabrous beneath, falcate or flexuous, mostly less than 10 cm. long, often much shorter, mostly less than 1 mm. wide when flattened out; panicle narrow, 3 to 10 cm. long, the branches distant, short and appressed, few-flowered; glumes unequal, the first 5 to 6 mm. long, about half as long as the second, mucronate but scarcely awned, 1-nerved, scabrous on the keel, the second similar to the first but glabrous on the keel; lemma about 1 cm. long including the 1 mm. long, short-pilose callus, gradually narrowed and scaberulous above, but not distinctly beaked; awns about equal, 2 to 2.5 cm. long, all spreading or nearly horizontal, flat at base and scarcely contorted.

Type in the U. S. National Herbarium, no. 820940, collected "in calcariis," near the sea at La Caimanera, Cuba, May, 1889, by H. Eggers (no. 5389).

The only other specimen seen was collected on a coral limestone beach at Fishermans Point, Guantánamo Bay, Cuba, by N. L. Britton (no. 2177).

This species resembles *A. cognata* in habit, but the strongly unequal glumes place it in the group Purpureae.

32. Aristida fendleriana Steud.

Aristida fendleriana Steud. Syn. Pl. Glum. **1**: 420. 1854. "Coll. *Fendler* nr. 973. N. Mexico." The type has been examined at Paris. A duplicate type is in the U. S. National Herbarium.

Aristida purpurea var. *fendleriana* Vasey, Contr. U. S. Nat. Herb. **3**: 46. 1892. Based on *A. fendleriana* Steud. The name appeared earlier in a different form, without description, as *A. purpurea* var. *fendleri* Vasey.[24]

Aristida fasciculata fendleriana Scribn. Trans. N. Y. Acad. Sci. **14**: 23. 1894. Based on *A. fendleriana* Steud.

Aristida subuniflora Nash in Small, Fl. Southeast. U. S. 116. 1903. "Type N. Mex., *Vasey*, in Herb. Nash," (op. cit. page 1327). A portion of the type is in the U. S. National Herbarium.

DESCRIPTION.

Plants perennial, often forming large bunches with numerous short curly leaves; culms erect, glabrous, 10 to 30 cm. tall; sheaths mostly basal, glabrous, villous at the throat; blades involute, curved or flexuous, scabrous on the upper surface, glabrous or somewhat scaberulous beneath, mostly less than 10 cm., often less than 5 cm. long, the innovations numerous; panicle erect, narrow, nearly simple, 2 to 6 cm. long, the pedicels appressed, mostly single or the lower in pairs; glumes unequal, 1-nerved, acute but not awned, the first about 7 mm. long, the second about twice as long; lemma about 12 mm. long, the callus nearly 1.5 mm. long, pubescent, the body glabrous, gradually narrowed to the summit, scaberulous on the upper half; awns about equal, divergent, 2 to 5 cm. long.

DISTRIBUTION.

Dry plains and hills Nebraska to Texas and Lower California.

NEBRASKA: Lavaca, *Bates* 870.

KANSAS: Seward County, *Hitchcock* 1011.

TEXAS: Palo Duro Canyon, *Ball* 1247. Canyon, *Rererchon* 4119. Tuscosa, *Rererchon* 2827. Texline, *Griffiths* 5618, 5632. El Paso, *Jones* 3740; *Chase* 5915. Delhart, *Hitchcock* 2536.

MONTANA: Billings, *Williams & Griffiths* 223.

WYOMING: Pinebluff, *Nelson* 3617. Powder River, *Nelson* 9396. Jelm, *Wooton* in 1914.

COLORADO: Los Pinos, *Baker* 89, 154. Durango, *Eastwood* in 1891. Buena Vista, *Sheldon* 605. Grand Junction, *Jones* 5469. Colorado Springs, *Williams* 9113; *Jones* 116. Salida, *Shear* 953. Hugo, *Tidestrom* 65. Trinidad, *Standley* 6031. Arboles, *Baker* 153. McCoy, *Shear & Bessey* 1364. Sedalia, *Hitchcock* 16230.

UTAH: Glenwood, *Ward* 70. Becks Hot Springs, *Garrett* 2371. Santa Clara, *Jones* 5114. Natural Bridge, *Rydberg & Garrett* 9489. Moab, *Rydberg & Garrett* 9104. Diamond Valley, *Goodding* 886.

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[24] Cat. Pl. U. S. Geogr. & Geol. Surv. W. 100th Merid. 55. 1874.

NEW MEXICO: Tunitcha Mountains, *Standley* 7813. Farmington, *Standley* 7058, 7093. Shiprock Agency, *Standley* 7273. Tierra Amarilla, *Eggleston* 6517. Quemado, *Wooton* in 1906. Cimarron Canyon, *Griffiths* 5520. Los Pilares, *Wooton* in 1906. Carlsbad, *Hitchcock* 13448. Organ Mountains, *Hitchcock* 3813. Sierra Grande, *Standley* 6101. Las Cruces, *Wooton* 1087. Santa Fe, *Standley* 6488. Brazos Canyon, *Standley & Bollman* 10744. Without locality, *Wheelers Exped., Rothrock* 18; *Fendler* 973.

ARIZONA: Santa Rita Reserve, *Griffiths* 4162. Tucson, *Pringle* in 1884. Celero Mountains, *Griffiths* 6132. Hawthorn, *Griffiths* 5824. Mount Eldon, *MacDougal* 355. Mormon Lake, *MacDougal* 91. Flagstaff, *Jones* in 1884; *Leiberg* 5506; *Griffiths* 4969, 7365; *Chase* 5836; *Hitchcock* 13207. Fort Apache, *Palmer* 575 in 1890. Jerome Junction, *Tidestrom* 923. Williams, *Barber* 51. Carrizo Mountains, *Standley* 7337. White Mountains, *Gray* 5430. Canyon Padre, *Hitchcock* 13238, 13248, 13249. Prescott, *Hitchcock* 13191; *Griffiths* 7336. Cosnino, *Jones* 4046. Adamana, *Chase* 5856; *Hitchcock* 10433. Bill Williams Mountain, *Chase* 5832. Phoenix Park, *Corille* 1089. Fort Huachuca, *Wilcox* 21. Ash Fork, *Griffiths* 7353.

CALIFORNIA: Banning, *Griffiths* 8008. San Bernardino County, *Parish* 10329. San Bernardino Mountains, *Parish* 3299, 3828.

LOWER CALIFORNIA: Topo, *Orcutt* 1146.

33. **Aristida longiseta** Steud.

Aristida longiseta Steud. Syn. Pl. Glum. **1**: 420. 1854. "*Fendler* coll. nr. 978. N. Mexico." The duplicate type in the U. S. National Herbarium consists of two plants, one 20 cm. tall and the other 30 cm. tall, with slender, mostly basal blades, the first glume awnless, 1 cm. long, the second glume slightly awned, 2 cm. long, the lemma nearly glabrous, 15 mm. long, the awns 6 to 8 cm. long.

Aristida purpurea var. *longiseta* Vasey in Wheeler, Rep. U. S. Surv. 100th Merid. **6**: 286. 1878. Based on *A. longiseta* Steud.

Aristida fasciculata var. *nuttalli* Thurb.; Beal, Grasses N. Amer. **2**: 208. 1896. Based on *A. longiseta* Steud.

DESCRIPTION.

Plants perennial, often in large bunches, the innovations numerous; culms erect, glabrous, mostly 20 to 30 cm. tall; sheaths glabrous, those of the innovations strongly villous at the throat; blades involute, curved or flexuous, scabrous on the upper surface, sometimes scaberulous beneath, usually less than 15 cm. long; panicle narrow, erect but not stiff, few-flowered, the axis only a few cm. long, the branches ascending or appressed, or the lower more or less curved or flexuous; glumes unequal, 1-nerved, narrowed to an awnless or only mucronate summit; the first mostly 8 to 10 mm. long, scabrous on the keel, the second about twice as long, glabrous; lemma terete, mostly 12 to 15 mm. long, the callus about 1 mm. long, densely short-pilose, the tip glabrous, the body only slightly narrowed above, glabrous or the upper part scaberulous but scarcely tuberculate-scabrous in lines as in *A. purpurea;* awns about equal, divergent, finally widely spreading, flat and sometimes a little contorted at base, mostly 6 to 8 cm. long.

This species differs from *A. purpurea* in the short upright panicle, longer glumes and awns, and the glabrous or only scaberulous fruit less narrowed above. Its tendency to invade fresh soil, such as fire guards and especially the dirt thrown up from the burrows of prairie dogs (*Cynomys ludovicianus*),

has given this and allied species the name of dogtown grass. At maturity the fruits are blown about by the wind and, on the plains, are produced in great quantities. These fruits become very troublesome to man and beast as they are swept across the country by the strong winds, the spreading awns holding the sharp points forward to catch in clothing, in the wool of sheep, and in the eyes and nostrils of grazing animals.

DISTRIBUTION.

Plains and foothills, North Dakota to northern Mexico and westward to Montana and Arizona.

NORTH DAKOTA: Mandon, *Sarvis* 98. Devils Lake, *Geyer* in 1839.

SOUTH DAKOTA: Stearns, *Wallace* 33. Indian Creek, *Williams* in 1891. Edgemont, *Hitchcock* 11082.

NEBRASKA: North Platte, *Shear* 279; *Rydberg* 2025. Thedford, *Rydberg* 1300. Lavaca, *Bates* 871. Long Pine, *Bates* 1121.

KANSAS: Rockport, *Bartholomew* in 1889. Ulysses, *Thompson* 63. Osborne, *Shear* 158. Ellsworth County, *Hitchcock* 589a. Manhattan, *Kellerman* 58. Fort Dodge, *Griffiths* 6554.

TEXAS: Amarillo, *Hitchcock* 16196; *Ball* 1611. Kerrville, *Hitchcock* 5267. San Antonio, *Hitchcock* 5182, 5193. Fort Worth, *Ruth* 168. Alpine, *Hitchcock* 13609. Big Spring, *Hitchcock* 13364. Bravo, *Ball* 1592. Fort McKavett, *Ball* 1544. New Braunfels, *Hitchcock* 5211. Midland, *Tracy* 7931, 7934. Spofford, *Griffiths* 6300. Fort Stockton, *Wooton* in 1913. Without locality, *Pringle* in 1883; *Nealley* in 1889.

OKLAHOMA: Hollis, *Stevens* 1057. Waynoka, *Stevens* 601.

MONTANA: Upper Big Horn River, *Blankinship* 184. Billings, *Williams & Griffiths* 222; *Hitchcock* 11206. Laurel, *Wooton* in 1915.

WYOMING: Platte Canyon, *Goodding* 136. Devils Tower, *Griffiths* 544. Newcastle, *Griffiths* 699. Torrington, *Nelson* 8296. Douglas, *Nelson* 8368.

COLORADO: Walsenburg, *Shear* 790. Denver, *Holzinger* 11; *Eastwood* 31. Julesburg, *Plank* 24. Fort Collins, *Crandall* 518. Colorado Springs. *Williams* 2118; *Redfield* 588. Durango, *Earle & Tracy* 973, 974. Grand Junction, *Jones* 5476x. McElmo Canyon, *Eastwood* in 1892. Manitou, *Hitchcock* 1779. Sedalia, *Hitchcock* 16237. Arboles, *Baker* 14. Silver Reef, *Jones* 5163w. Rocky Ford, *Griffiths* 3304a. Trinidad, *Shear* 12.

UTAH: Antelope Island, *Watson* 1297. Springdale, *Jones* 5249.

NEW MEXICO: Ute Park, *Standley* 13670, 13961. Knowles, *Wooton* in 1909. El Rito, *Wooton* 2984. Cimarron Canyon, *Griffiths* 5521, 5522, 5591. Albuquerque, *Jones* in 1884. Pecos, *Standley* 4943. Zuni Reservation, *Wooton* 1086. Raton, *Standley* 6317. Deming, *Hitchcock* 3750. Roswell, *Griffiths* 5727, 5755. Mangas, *Metcalfe* in 1897. White Sands, *Wooton* 404. Santa Fe, *Heller* 3535; *Wooton* 2935. Socorro, *Plank* 74. Las Vegas, *Chase* 5859. Rosa, *Baker* 152. Chamita, *Wooton* 2924. Without locality, *Fendler* 978.

ARIZONA: Canyon Padre, *Hitchcock* 13246. Prescott, *Wooton* in 1911. Seligman, *Wooton* in 1911. Tucson, *Toumey* in 1892. Oak Creek, *Rusby* 23. Ash Fork, *Griffiths* 4343, 4752, 7355. St. Johns, *Griffiths* 5794. Canyon Duchelly, *Griffiths* 5860. Fort Apache, *Palmer* 575 in 1890. Adamana, *Chase* 5851, 5852, 5858. Hackberry, *Jones* in 1884. Carrizo Mountains, *Standley* 7487. Congress, *Orcutt* 2532. Santa Rita Mountains, *Griffiths & Thornber* 308.

CHIHUAHUA: Chihuahua, *Pringle* 473.

TAMAULIPAS: Buena Vista, *Wooton* in 1919.

33a. Aristida longiseta robusta Merr.

Aristida longiseta robusta Merr. U. S. Dept. Agr. Div. Agrost. Circ. 34: 5. 1901. "Indian Creek [Montana], 336 *F. L. Scribner*, July 5, 1883 (type)." The specimen is in the U. S. National Herbarium. Culms about 40 cm. tall; no tuft of innovations; axis of panicle 10 cm. long; awns 5 cm. long; fruiting lemma 13 mm. long, slightly scaberulous toward summit.

DESCRIPTION.

Differs from *A. longiseta* in being taller and more robust, 30 to 50 cm. tall, the innovations fewer and the blades longer, not in conspicuous basal tufts or cushions; panicle longer; stiffer, and the branches stiffly ascending rather than curved or flexuous; awns mostly 4 to 5 cm. long.

Its greater size, stiffer panicle, and shorter awns give the plant a different aspect, though the technical characters are similar to those of the species.

DISTRIBUTION.

Range and habitat similar to that of the species; more common northward.

BRITISH COLUMBIA: Spencers Bridge, *Macoun* in 1889.

SOUTH DAKOTA: Rosebud, *Wallace* 34. Lebanon, *Griffiths* 252. Jamesville, *Bruce* 126. Redfield, *Griffiths* 68. Belle Fourche, *Griffiths* 404. Canning, *Griffiths* 43. Frozen Mans Creek, *Williams* 67. Aurora County, *Wilcox* 35. Custer, *Rydberg* 1118.

IOWA: Rock Rapids, *Ball* 410.

NEBRASKA: Long Pine, *Bates* 1123. St. Helena, *Clements* 2629. McCook, *Pammel* 392.

KANSAS: Riley County, *Norton* 589; *Hitchcock* 263. Osborne, *Shear* 156. Wakeeney, *Reed* in 1892. Tribune, *Rose & Fitch* 17080.

TEXAS: Amarillo, *Hitchcock* 16194. Spofford Junction, *Wooton* 2004. San Antonio, *Hitchcock* 5339. Big Spring, *Hitchcock* 13349, 13377, 13418. Sarita, *Hitchcock* 5460.

OKLAHOMA: Avard, *Stevens* 1696. Whitehorse, *Stevens* 722.

MONTANA: Belt Creek, *Scribner* 336. Prickly Pear Canyon, *Williams* 559. Missoula, *Williams & Griffiths* 250. Glendire, *Ward* in 1883.

WYOMING: Clear Creek, *Williams & Griffiths* 116. Devils Tower, *Griffiths* 517. Whalen Canyon, *Nelson* 540. Sheridan, *Nelson* 311. Newcastle, *Nelson* 8439.

IDAHO: Idaho Falls, *Merrill & Wilcox* 435. Without locality, *Wilcox* in 1881.

WASHINGTON: Alma, *Elmer* 536; *Hunter* 637. Rock Island, *Sandberg & Leiberg* 439. Spokane, *Sandberg, Heller & MacDougal* 906; *Piper* 2597; *Suksdorf* 8753. Lyons Ferry, *Griffiths & Cotton* 547. Prosser, *Cotton* 639.

OREGON: Wallowa County, *Sheldon* 8298. Without locality, *Wilkes Exped.*

COLORADO: Hugo, *Wooton* in 1914. Akron, *Wooton* in 1913. Sedalia, *Hitchcock* 16225, 16227. Colorado Springs, *Tracy* 496. Greeley, *Hitchcock* in 1901. Manitou, *Chase* 5300; *Hitchcock* 1780. Trinidad, *Shear* 20. Trail Glen, *Clements* 40. Without locality, *Powell's Exped.* 671, 672; *Hall & Harbour* 652.

UTAH: Uinta, *Jones* in 1880. Becks Hot Springs, *Garrett* 2346. Salt Lake City, *Smith* 1827.

NEW MEXICO: Mesilla, *Wooton* 42. Los Pilares, *Wooton* in 1906. Tucumcari, *Wooton* in 1914.

ARIZONA: Williams, *Griffiths* 4928. Payson, *Toumey* in 1892. Tucson, *Toumey* in 1892. North Arizona, *Lemmon* 4632.

COAHUILA: Diaz, *Pringle* 9037.

33b. Aristida longiseta rariflora Hitchc., subsp. nov.

DESCRIPTION.

Differs from the species in the few-flowered panicle with capillary flexuous branches bearing 1 or 2 spikelets.

Type in the U. S. National Herbarium, no. 745501, collected in Tom Green County, Texas, May 1880, by Frank Tweedy.

This form bears the same relation to *A. longiseta* that *A. purpurea laxiflora* does to *A. purpurea*. The two subspecies have the same aspect, but differ in the spikelet characters. More information is needed on both forms. They may prove to be distinct species. Being scattered here and there through the range of the respective species they are referred to them as subspecies.

DISTRIBUTION.

Dry plains, Texas to Arizona, and Colorado.

TEXAS: Del Rio, *Hitchcock* 13637. San Antonio, *Havard* in 1882; *Hitchcock* in 1903; *Plank* 45. Tom Green County, *Tweedy* in 1880. Llano, *Plank* 6.
COLORADO: Without locality, *Vasey* in 1868; *Hall*.
NEW MEXICO: Without locality, *Vasey*.
ARIZONA: Apache Smelter, Santa Catalina Mountains, *Griffiths* 7123. Ash Fork, *Griffiths* 7354.

34. Aristida lanosa Muhl.

Aristida lanata Poir. in Lam. Encycl. Suppl. 1: 453. 1810. Not *A. lanata* Forsk. 1775. Poiret says, "Cette plante a été recueillie par M. Bosc dans la Caroline (V. s. Comm. Bosc)." In the Padua Herbarium is a specimen collected in South Carolina by Bosc. There is no fruit, but the tall stiff stem and the lanate sheaths are characteristic. The specimen is labeled *A. lanuginosa* Bosc, which name appears to have been changed by Poiret to *lanata*. In the Delessert Herbarium is a specimen of Bosc's collection of this species with fruiting panicles. Trinius[25] mentions *A. lanuginosa* Bosc in a note under *A. stricta*. Later Trinius[26] mentions it again under *A. stricta*, giving the author as Clarion, and states at the end of his note "V. spec. Clar. ex Am. bor. in Hb. Mertens s. n. *A. lanuginosa* Bosc."

Aristida lanosa Muhl; Ell. Bot. S. C. & Ga. 1: 143. 1816. Elliott cites no special locality, but the vicinity of Charleston would be assumed. Muhlenberg[27] gives the locality as "Carolina." The type has been examined in the Elliott Herbarium.

Chaetaria gossypina Beauv.; Roem. & Schult. Syst. Veg. 2: 391. 1817. Based on *Aristida lanata* Poir. The name only was used earlier by Beauvois[28] and credited to Bosc.

Aristida perennis Panzer, Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 104. 1842. Trinius and Ruprecht append to *A. virgata* a note on *A. perennis* Panzer "in Hb. Willd! n. 1799 e Carolina," showing how the latter differs from the former. The description applies to *A. lanosa*.

Aristida lanuginosa Clarion; Steud. Syn. Pl. Glum. 1: 133. 1854. "Am. sptr." This is based on the Bosc specimen cited above (under *A. lanata* Poir.),

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[25] Mém. Acad. St. Pétersb. VI. Sci. Nat. 2[1]: 46. 1836.
[26] Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 103. 1842.
[27] Descr. Gram. 174. 1817.
[28] Ess. Agrost. 30, 158. 1812.

inasmuch as Steudel refers to "Trin. Act. Petr. 1836. p. 46" and "Stipac. p. 103."

Moulinsia lanosa Raf. Ind. Kew. 3: 267. 1894. Based on *Aristida lanosa* Muhl.

DESCRIPTION.

Plants perennial; culms solitary or few in a tuft, erect, rather robust, glabrous, 1 to 1.5 meters tall; sheaths lanate-pubescent or rarely glabrous, overlapping; blades flat, tapering to a fine involute point, scabrous on the upper surface, glabrous beneath, as much as 50 cm. long and 4 mm. wide; panicle narrow, rather loose, as much as 40 cm. long, the branches ascending or appressed, the lower distant, as much as 10 cm. long, lanate-pubescent at base; glumes unequal, 1-nerved, acute or awn-pointed, the first 12 to 14 mm. long, scabrous on the keel and more or less on the back, the second about 1 cm. long, glabrous on the keel; lemma 8 to 19 mm. long, pubescent on the callus, scabrous on the keel and on the sides toward the summit, scarcely beaked; awns unequal, the central horizontally spreading, or reflexed from a curved base, 1.5 to 2.5 cm. long, the lateral half to two-thirds as long, erect or horizontally spreading, the base a little contorted.

DISTRIBUTION.

Dry sandy soil of the Coastal Plain, Delaware to Florida and Texas.

MISSOURI: Stoddard County, *Bush* 158 (Gray Herb.).
DELAWARE: Millsboro, *Canby* in 1880. Cedar Neck, *Commons* 326. Seaford. *Commons* 121. Faulkland, *Commons* in 1883.
MARYLAND: Salisbury, *Canby* in 1863.
VIRGINIA: Prince Edward County, *J. D. Smith* in 1880.
NORTH CAROLINA: Wilmington, *Hitchcock* in 1905.
SOUTH CAROLINA: Isle of Palms, *Chase* 4523; *Hitchcock* 165. Aiken, *Ravenel* in 1869.
GEORGIA: Leslie, *Harper* 1715. Lumpkin, *Latimer* in 1885.
FLORIDA: Gainesville, *Chase* 4215. Grasmere, *Combs* 1093. Aspalaga, *Biltmore Herb.* 1109a. Jacksonville, *Curtiss* 3430, 4044, 5350; *Kearney* 168 (glabrous). Orange County, *Baker*. Baldwin, *Combs* 66½ (glabrous).
ALABAMA: Gateswood, *Tracy* in 1903. Mobile, *Mohr* in 1878. Wilson, *Mohr* in 1891. Auburn, *Earle & Baker* in 1897; *Earle & Earle* 5.
MISSISSIPPI: Biloxi, *Tracy* 1394, 3502, 3721, 3902; *Kearney* 304. Ocean Springs, *Skehan* 22528. Waynesboro, *Kearney* 187.
TEXAS: Dallas, *Reverchon* 2243; *Bush* 1617. Texarkana, *Letterman* 7.
OKLAHOMA: Sapulpa, *Bush* 757.

35. Aristida scribneriana Hitchc.

Aristida lanuginosa Scribn. Contr. U. S. Nat. Herb. 17: 278. 1913. Not *A. lanuginosa* Clarion, 1854. The type of *A. lanuginosa* Scribn. is "in the U. S. National Herbarium, no. 691230, collected on 'Hills near Guadalajara, Jalisco,' Mexico, October 28, 1889, by C. G. Pringle (no. 2375)."

DESCRIPTION.

Plants perennial; culms cespitose, about 1 meter tall, erect, lanate-pubescent except in the region of the nodes, scabrous below the panicle; leaves mostly basal, the sheaths lanate-pubescent except above the nodes, this portion glabrous; blades 10 to 25 cm. long, 1 to 2 mm. wide, ending in a long fine

point, sparsely lanate-pubescent, the older culm blades flat and curled, the upper culm blades and those of the innovations involute; panicle 10 to 25 cm. long, narrow, the branches appressed, the lowermost as much as 10 cm. long, naked below, a short branchlet at base; spikelets on short appressed pedicels; glumes 1-nerved, acuminate or short-awned, sparsely lanate, scabrous on the keels, the first 6 to 7 mm. long, the second about 1 to 2 mm. longer; lemma smooth below except the short-pilose callus, scabrous above, tapering into a scabrous, slightly twisted beak, the entire length, including the beak, about 11 mm.; awns subequal, somewhat spreading, the central one about 15 mm. long, the lateral about 12 mm. long.

Griffiths' no. 8131 is only slightly lanate on the culms and sheaths, but the glumes are beset with long flexuous hairs.

DISTRIBUTION.

Rocky hills and gravelly plains, Pacific slope of Mexico.

DURANGO: Durango, *Hitchcock* 7649.
JALISCO: Guadalajara, *Pringle* 2375, 11734; *Hitchcock* 7324; *Griffiths* 8131.
MICHOACÁN: Morelia, *Arsène* 2631.

36. Aristida neglecta Léon, sp. nov.[29]

DESCRIPTION.

Plants perennial; culms loosely cespitose, erect, wiry, glabrous, 40 to 60 cm. tall; sheaths glabrous, much shorter than the internodes, distributed along the culm, villous at the throat, the hairs deciduous; ligule a ciliate membrane less than 0.5 mm. long; blades stiff and firm, soon involute, sharp-pointed, usually not over 5 cm. long, often shorter, less than 1 mm. wide, glabrous beneath, scabrous-puberulent on the upper surface; panicle narrow, 5 to 10 cm. long, the branches distant, rather stiffly ascending, 1 to 2 cm. long, bearing 1 or 2 branchlets at base, few-flowered; glumes equal or the second a little longer, 7 to 9 mm. long, 1-nerved, acuminate or awn-pointed, the first scaberulous on the keel, the second glabrous; lemma about 1 cm. long, the callus pilose, less than 1 mm. long, the body glabrous, terete, gradually tapering into a scabrous twisted beak 3 to 4 mm. long; awns about equal, divergent, finally nearly horizontal, 10 to 15 mm. long, slightly contorted at base.

Type in the U. S. National Herbarium, no. 1,064,517, collected on open grassy hills, called Jata Hills or "Lomas de las Jatas," Guanabacoa, Province of Habana, Cuba, February 12, 1921, by E. L. Ekman.

This species differs from *A. curtifolia* in the twisted beak of the lemma and from *A. refracta* in the scarcely contorted awns, and from both in habit. In the former species the very short blades tend to be in pairs and in the latter they are clustered at the base. The leaves of *A. neglecta* are distributed uniformly along the culm and are not clustered at the base.

DISTRIBUTION.

Grassy barrens, Cuba and Hispaniola.

CUBA: Guanabacoa, *Léon* 871, 872, 874, 2875, 5015; *Hitchcock* 500; *Wilson & Léon* 11645. Palm barrens west of Guane, *Shafer* 10364, 10630. San Julián de Guane, *Léon* 7030, 7031. Madruga, *Léon* 3455, 6374. Cuabal

[29] The type specimen was received from Dr. E. L. Ekman with the manuscript name here published. Brother Léon, of the Colegio de la Salle, Vedado, Habana, has done much to develop our knowledge of Cuban botany.

de Jesús María-Minas, *Léon* 5213. Between San Diego de los Baños and La Palma, *Léon* 4844. Sancti Spiritus, *Léon* 8993. Motembo Mines, *Léon* 8639. Caimanera Naval Station, *Hioram* 7. Manacas, *Léon* 5834. Placetas del Sur, *Léon* 6425. Holguin, *Shafer* 1183. Hanábana, *Wright* 737. Isle of Pines, *Britton, Britton & Wilson* 14414. Without locality, *Wright* 742, 3433.

HAITI: St. Michel, *Buch* 1075.

37. Aristida arizonica Vasey.

Aristida arizonica Vasey, Bull. Torrey Club **13**: 27. 1886. "Collected in Arizona." The specimen selected as the type was collected near Las Vegas, New Mexico, by G. R. Vasey in 1881. This specimen bore in Dr. George Vasey's hand, the name *arizonica* (since partly erased and written over in ink in another hand) and a diagnosis in Vasey's hand, showing that this is the specimen actually studied in preparing the description. Dr. Vasey probably had before him also *Rusby* 875 from the San Francisco Mountains, Arizona, collected in 1883.

Aristida orizabensis Fourn. Mex. Pl. **2**: 78. 1886. "Valle de Orizaba (*Schaffn.* n. 136 in herb. Franq., *F. Mull.* n. 2103)." Both specimens have been examined, the first in the Paris Herbarium and the second in the St. Petersburg Botanical Garden. The glumes and lemma are 10 to 12 mm. long, the latter with a short beak only slightly twisted. These are doubtfully referred to *A. arizonica*.

Aristida appressa Vasey, Contr. U. S. Nat. Herb. **1**: 282. 1893. "Collected at Guadalajara by Dr. Edward Palmer in 1885." The type specimen is in the U. S. National Herbarium. The date is an error for 1886, as Dr. Palmer was not in Jalisco in 1885. The beak of the lemma is slender and twisted.

Aristida appressa var. *brevior* Vasey, Contr. U. S. Nat. Herb. **1**: 282. 1893. "Collected at Río Blanco by Dr. Edward Palmer (No. 516) in 1886." The type specimen is in the U. S. National Herbarium. Río Blanco is near Guadalajara. The beak of the lemma is short and scarcely twisted.

Aristida pseudospadicea Hubb. Proc. Amer. Acad. **49**: 500. 1913. "Type (in the Gray Herb.) and only specimen seen, pine ridge near Manatee Lagoon, June 11, 1905, *M. E. Peck*, no. 31." A part of the type specimen is in the U. S. National Herbarium.

DESCRIPTION.

Plants perennial; culms cespitose, erect, glabrous, slightly roughened below the panicle, 30 to 120 cm. tall; sheaths glabrous, sometimes villous at the throat; blades flat, narrowed into a fine involute point, or some of them involute throughout, scaberulous on the upper surface, glabrous beneath, 10 to 30 cm. long, 1 to 4 mm. wide, the older ones usually curled or flexuous; panicles narrow, erect or somewhat nodding, closely flowered or more or less interrupted at base, 10 to 25 cm. long, the branches appressed, crowded or rather distant, the lower mostly 5 to 10 cm. long, sometimes longer, the axis very scabrous; spikelets appressed and closely set on the branchlets; glumes equal or slightly unequal, awn-pointed, or with an awn 1 to 2 mm. long, 1-nerved, mostly 10 to 15 mm. long, the first scabrous on the keel and sometimes on the back, the second glabrous; lemma 1 to 1.5 cm. long, including the more or less twisted beak of about 3 to 5 mm., the callus pilose, about 1 mm. long; awns about equal, ascending or somewhat spreading, mostly 1 to 2 cm. long.

DISTRIBUTION.

Dry plains, stony hillsides, and open forest, mostly at 1,500 to 2,500 meters altitude, Colorado to Paraguay.

COLORADO: Spanish Peaks, 3000 meters, *Chase* 5402.
NEW MEXICO: Ute Park, *Standley* 13389, 13995, 14296, 14463. Vermejo Park, *Wooton* in 1913. White Mountains, *Wooton & Standley* in 1907. Without locality, *Wright* 2007.
ARIZONA: San Francisco Mountains, *Rusby* in 1883; *Leiberg* 5740. Chiricahua Mountains, *Toumey* in 1896. Flagstaff, *Chase* 5848; *Griffiths* 5882, 7373; *Jones* in 1884; *Hitchcock* 13240. Coconino National Forest, *Pearson* 49. White Mountains, *Griffiths* 5275, 5368. Harts Ranch, *Rusby* 875.
SINALOA: Cerro Colorado, *Brandegee* in 1904.
CHIHUAHUA: Miñaca, *Hitchcock* 7752, 7764. Sánchez, *Hitchcock* 7709, 7717. Southwestern Chihuahua, *Palmer* 5 in 1885. Santa Eulalia Mountains, *Pringle* 389 (Gray Herb.).
TEPIC: Tepic, *Palmer* 1916 in 1892.
JALISCO: Río Blanco, *Palmer* 517, 520 in 1886. Guadalajara, *Pringle* 1810, 2622. Zapotlán, *Hitchcock* 7115, 7145.
VERACRUZ: Orizaba, *Bourgeau* 3357.
PUEBLA: Puebla, *Arsène* 1041, 1780.
FEDERAL DISTRICT: *Pringle* 6549; *Hitchcock* 5935.
MORELOS: Cuernavaca, *Holway* 3020.
MICHOACÁN: Morelia, *Arsène* 2594, 2972.
OAXACA: Oaxaca, *Hitchcock* 6139. Las Sedas, *Smith* 918.
GUATEMALA: Amatitlán, *Popenoe* 693b. Guatemala City, *Hitchcock* 9076, 9102.
PANAMA: Olá, *Pittier* 5019, 5047, 5066.
COLOMBIA: Neiva, Dept. Huila, *Rusby & Pennell* 1036. Santa Marta, *Smith* 136.
PARAGUAY: San Salvador, *Rojas* 2734.

38. Aristida barbata Fourn.

Aristida barbata Fourn. Mex. Pl. 2: 78. 1886. "In valle Mexicensi (*Schaffn.* n. 513 in herb. Coss.)." This specimen has been examined at Paris. The beak of the lemma is twisted.

DESCRIPTION.

Plants perennial; culms erect, wiry, glabrous, 30 to 60 cm. tall; sheaths glabrous, villous at the throat; ligule very short; blades involute, firm, glabrous on outer surface or scabrous toward tip, 10 to 20 cm. long; panicle erect, narrow, the branches appressed, 10 to 15 cm. long; glumes equal, about 1 cm. long, gradually narrowed into an awn, the first 1-nerved, scabrous on the keel, the second obscurely 3-nerved, glabrous; lemma about as long as the glumes, the upper third narrowed into a twisted neck; awns equal, ascending or somewhat spreading, 12 to 15 mm. long.

This species differs from *A. arizonica* in the involute blades and villous throat of the sheaths.

DISTRIBUTION.

Rocky hills, central Mexico.

PUEBLA: Tehuacán, *Pringle* 8592; *Hitchcock* 6084. Esperanza, *Hitchcock* 6487
OAXACA: Las Sedas, *Smith* 918.

39. Aristida stricta Michx.

Aristida stricta Michx. Fl. Bor. Amer. 1: 41. 1803. "Hab. in Carolina inferiore." The type has been examined at the Paris Museum.

Chaetaria stricta Beauv. Ess. Agrost. 30, 152, 158. 1812. Based on *Aristida stricta* Michx.

? *Aristida beyrichiana* Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5: 104. 1842. "In pinetis Georgiae et in territorium Arkansas. (Beyrich)". The type is in the Trinius Herbarium and a fragment is in the U. S. National Herbarium. The specimen is young, the awns only partly developed. The specimen appears to be *A. stricta*, but from the fragment examined it is impossible to state with certainty.

DESCRIPTION.

Plants perennial; culms cespitose, erect, glabrous, 50 to 100 cm. tall; sheaths glabrous, pubescent about the throat; blades closely involute, scabrous on the upper surface, villous above the base, glabrous beneath, firm, somewhat flexuous, as much as 30 or 40 cm. long, about 1 mm. thick when rolled; panicles long and slender, as much as 30 cm. long or even more, the branches appressed, the lower usually rather distant, as much as 5 cm. long, floriferous from the base; glumes about equal, awn-tipped, 7 to 9 mm. long, the first 1-nerved or with an additional nerve on one side, glabrous on the back, scaberulous on the keel, the second 1-nerved, glabrous on back and keel; lemma glabrous except the pubescent callus, about 6 mm. long, scarcely beaked; awns about equal, divergent, sometimes horizontally spreading, the central 1 to 1.5 cm. long, the lateral a little shorter.

DISTRIBUTION.

Common in pine barrens, North Carolina to Florida, west to Mississippi.

North Carolina: Wilmington, *Chase* 4565, 7152; *Coville* 100; *Kearney* 256; *Hitchcock* 198.

South Carolina: Aiken, *Ravenel* in 1866.

Georgia: Albany, *Tracy* 3710, 3711, 3717. Cordele, *Tracy* 1490. Eastman, *Mohr* in 1893. Camp Cornelia, *Ricker* 937. Ruskin, *Ricker* 907. Quitman, *Harper* 1620.

Florida: Fort Myers, *Standley* 13076; *J. Standley* 224; *Hitchcock* 444. Tampa, *Garber* in 1877; *Combs* 1345, 1366. Miami, *Garber* in 1877; *Chase* 3881. Freeport, *Mohr* in 1880. Brevard County, *Fredholm* 5988, 6145. Clarcona, *Pieters* 72, 76. Lake City, *Bitting* 769, 788, 1052, 1446; *Hitchcock* 2276. Eustis, *Hitchcock* 2274; *Nash* 407, 1620, 1642. Madison County, *Hitchcock* 2275. Jacksonville, *Curtiss* 3426, 4048, 5184. Titusville, *Chase* 3977. Waldo, *Combs* 697. Avondale, *Combs* 497. De Funiak Springs, *Combs* 436, 474. Dunellen, *Combs* 910. Old Town, *Combs* 850. Quincy, *Combs* 428. Braidentown, *Combs* 1258, 1290, 1317. Bartow, *Combs* 1212. Crystal, *Combs* 1018. Chipley, *Combs* 550. Felsmere, *Tracy* 9252. Homosassa, *Combs* 952. Grasmere, *Combs* 1162. Sneeds Island, *Tracy* 6463. Chattahooche, *Tracy* 3713, 3714, 3718. Johns Pass, *Tracy* 7182. Cocoanut Grove, *Small & Carter* 569; *Small & Nash* 178. Aspalaga, *Biltmore Herb.* 1124a. Without locality, *Rugel* 236.

Mississippi: Scranton, *Tracy* 4663. Ocean Springs, *Tracy* 144.

40. Aristida erecta Hitchc.

Aristida erecta Hitchc. Contr. U. S. Nat. Herb. 12: 236. 1909. "The type specimen was collected by Wright in Cuba in 1865, no. 41161, in the U. S.

National Herbarium." This specimen is numbered in pencil 2432, which is an error for 3432.

DESCRIPTION.

Plants perennial; culms erect, rather stout, glabrous, as much as 1.5 meters tall; sheaths glabrous, longer than the internodes; blades flat, becoming involute, especially toward the much-attenuate tip, scabrous on the upper surface, glabrous beneath, as much as 1 meter long, 3 to 5 mm. wide; panicles narrow, as much as 50 cm. long, the numerous very scabrous branches ascending or appressed, the lower as much as 10 cm. long or even longer, all spikelet-bearing from the base, the spikelets crowded on erect rather stout pedicels 2 to 3 mm. long; glumes glabrous on the back, unequal, acuminate or awn-tipped, the first 3-nerved with one of the lateral nerves indistinct, scabrous on the keel, 12 to 15 mm. long, the second 1-nerved, smooth on the keel, 2 to 3 mm. shorter than the first; lemma 12 to 13 cm. long, glabrous on the body, the short indefinite obscurely twisted beak scabrous toward the summit, the callus pilose; awns divergent or horizontally spreading, the central 2 to 3 cm. long, the lateral somewhat shorter, the curved base not warped.

DISTRIBUTION.

Savannas of western Cuba.

CUBA: Herradura, *Tracy* 9076. San Julián, south of Guane, *Léon & Roca* 6918. San Diego, *Léon & Charles* 4852. Santa Cruz de los Piños, *Ekman* in 1923. Isle of Pines, *Britton, Britton & Wilson* 14959. Without locality, *Wright* 3432.

41. Aristida purpurascens Poir.

Aristida purpurascens Poir. in Lam. Encycl. Suppl. 1: 452. 1810. "Cette plante m'a été communiquée par M. Bosc, qui l'a recueillie dans la Caroline (V. s.)." Bosc's collections were made mostly in the vicinity of Charleston, South Carolina, though he made a trip to Wilmington, North Carolina. The type has not been examined.

Chaetaria purpurascens Beauv. Ess. Agrost. 30, 152, 158. 1812. Based on *Aristida purpurascens* Poir.

Aristida racemosa Muhl. Descr. Gram. 172. 1817. Not *A. racemosa* Spreng. 1807. No locality given, but assumed to be in the vicinity of Lancaster, Pennsylvania, where Muhlenberg lived. The type is in the Muhlenberg Herbarium. Elliott describes this species under *A. stricta* Michx.[80]

Chaetaria affinis Schult. Mant. 2: 210. 1824. Based on *Aristida racemosa* Muhl.

Aristida affinis Kunth, Rév. Gram. 1: 61. 1829. Based on *Chaetaria affinis* Schult.

Aristida elliottiana Steud. Syn. Pl. Glum. 1: 133. 1854. Based on *Aristida stricta* Ell.

Aristida geyeriana Steud. Syn. Pl. Glum. 1: 133. 1854. "*A. stricta* in Hrbo. Ch. A. Geyer sec. spec. a Kampmannio communicatum. [sign for perennial]. Illinois." The type has not been examined. The locality and description indicate *A. purpurascens*, except that the leaves are described as convolute. In the Gray Herbarium there is a specimen, probably a duplicate type, labeled "*Aristida stricta* Mich. Sandy, Beardstown, Ill. Aug. 1842. Ch. A. Geyer."

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[80] Bot. S. C. & Ga. 1: 142. 1816.

Aristida purpurascens var. *minor* Vasey, Contr. U. S. Nat. Herb. 1: 46. 1892. "Southern States to Texas." Several specimens are labeled with the varietal name in Vasey's hand. A specimen collected on Horn Island, Mississippi, in 1891 by S. M. Tracy (no. 1564) may be accepted as the type.

Aristida purpurascens glaucissima Kearn. U. S. Dept. Agr. Div. Agrost. Bull. **24**: 45. 1901. "Type [in the U. S. National Herbarium] collected by T. H. Kearney, jr., No. 321, in very dry, sterile soil in an opening in the pine forest, 6 miles above Biloxi, Mississippi, October 7, 1896."

DESCRIPTION.

Plants perennial, rarely glaucous; culms cespitose from a rather thin weak base, erect or somewhat decumbent at base, slender, glabrous, mostly 40 to 70 cm. tall, sometimes as much as 1 meter, the lower internodes sometimes somewhat zigzag; sheaths glabrous or the lower with a few loose hairs, more or less compressed and keeled, especially the lower overlapping ones; blades flat, rather lax and flexuous, scabrous on the upper surface, sometimes with a few loose hairs toward the base, glabrous beneath, mostly 10 to 20 cm. long, usually less than 2 mm. wide; panicle narrow, rather lax and nodding, one-third to half the length of the culm, the branches rather laxly appressed, 1 to 2 cm. long, sometimes more; glumes about equal or the lower a little longer, 9 to 12 mm. long, usually mucronate, 1-nerved or the first with a weak nerve on one side, the first scabrous on the keel and often on the back, the second glabrous or nearly so; lemma a little shorter than the glumes, about 7 mm. long, slightly pubescent on the 0.5 mm. long callus, glabrous on the body, scabrous on the keel and at the scarcely beaked summit; awns about equal, or the central a little longer, finally all divergent, horizontally spreading or somewhat reflexed, 1.5 to 2.5 cm. long.

DISTRIBUTION.

Dry sandy soil, Massachusetts to Florida, west to Missouri and Texas; also Bahamas and western Cuba.

MASSACHUSETTS: Duxbury, *Knowlton* in 1911. Essex County, *Conant* in 1878. Concord, *Greenman* 3225.

RHODE ISLAND: Without locality, *Olney* (Gray Herb.).

NEW YORK: Wading River, Long Island, *Miller* in 1877.

NEW JERSEY: Freehold, *Pearce* in 1885. Atco, *Brinton* in 1889. Hammonton, *Scribner* 250. Califon, *Fisher* in 1902. Fairton, *Commons* 331.

PENNSYLVANIA: Chester County, *Bebb* in 1863. Chambersburg, *Porter* in 1897. Easton, *Porter* in 1888.

OHIO: Bowling Green, *Kneucker*, *Gram. Exs.* 193. Erie County, *Moseley* in 1896.

INDIANA: Tolleston, *Hill* 184 in 1898. Porter, *Chase* 684. Michigan City, *Deam* 29766. Dune Park, *Chase* 225, 1963, 1993; *Umbach* 4985. McCool, *Hill* 109 in 1910.

ILLINOIS: Mason County, *Vasey* in 1861.

MISSOURI: Monteer, *Bush* 3584. Eagle Rock, *Bush* 682. Scott County, *Eggert* 175. Graydon Springs, *Standley* 9894.

DELAWARE: Townsend, *Commons* 329. Millsboro, *Commons* 330. Greenbank, *Commons*, 328. Centerville, *Commons* 327.

MARYLAND: Great Falls, *Ball* 82.

DISTRICT OF COLUMBIA: *Chase* 253; *Dewey* 133; *Hitchcock* 2401; *Vasey* in 1874; *Van Eseltine & Moseley* 235.

VIRGINIA: Cape Charles, *Canby & Rose* 859. Princess Anne County, *Kearney* 2117.

NORTH CAROLINA: Swannanoa, *Biltmore Herb.* 1113b. Wilmington, *Chase* 4563.
SOUTH CAROLINA: Orangeburg, *Hitchcock* in 1905. Clemson College, *House* 2869. Isle of Palms, *Chase* 4534.
GEORGIA: Leslie, *Harper* 590, 1719. Stone Mountain, *Chase* 4514.
FLORIDA: Hillsborough County, *Fredholm* 6462. Tampa, *Nash* 2424; *Combs* 1365, 1367. Aspalaga, *Biltmore Herb.* 1113a. Punta Rassa, *Hitchcock* 443. Sanibel, *Hitchcock* in 1900. Apalachicola, *Kearney* 107. St. Georges Island, *Kearney* 127. Perico Island, *Tracy* 7372. Lavignes Landing, *Baker* 252. Fort Myers, *Standley* 12916. Gainesville, *Chase* 4228, 4244. Cutler, *Small & Carter* 918. Brevard County, *Fredholm* 6096. Grasmere, *Combs* 1083. Arcadia, *Combs* 1283. Lake City, *Chase* 4295. Miami, *Chase* 3870. Little River, *Easton* 490. Jenkins, *Easton* 199, 232. Jacksonville, *Curtiss* 5183. Duval County, *Curtiss* 3429*. St. Vincents Island, *McAtee* 1777.
KENTUCKY: Wasiota, *Kearney* 314.
TENNESSEE: Knoxville, *Ruth* 27, 663.
ALABAMA: Pisgah, *Chase* 4486. Tensau, *Tracy* 8017. Mobile, *Mohr* in 1878, 1879, 1882, and 1891.
MISSISSIPPI: Panola County, *Eggert* 121. Horn Island, *Tracy* 1564, 1882. Koshtaw, *Tracy* 4669. Biloxi, *Tracy* 3073, 3852, 3853, 4662, 4668; *Kearney* 309, 321. Waynesboro, *Kearney* 107, 164.
ARKANSAS: Benton County, *Plank* 89. Northwest Arkansas, *Harvey* 10.
LOUISIANA: Calhoun, *Ball* 58. Covington, *Arsène* 11138. Natchitoches, *Ball* 154. Calcasieu, *Ball* 201.
TEXAS: Handley, *Reverchon* 3480B. Del Rio, *Hitchcock* 13638. Brazos County, *Nealley* in 1882. Texarkana, *Plank* 81; *Heller* 4274. Dallas, *Reverchon* 1060. Corsicana, *Reverchon* 3477. Weatherford, *Tracy* 8239.
OKLAHOMA: Lincoln County, *Blankinship* in 1895 (Gray Herb.).
BAHAMAS: New Providence, *Eggers* 4447.
CUBA: Isle of Pines, *Taylor* 20; *Palmer & Riley* 995. Herradura, *Hitchcock* 232; *Tracy* 9095. Without locality, *Wright* 3831, 3832.

42. Aristida liebmanni Fourn.

Aristida liebmanni Fourn. Mex. Pl. **2**: 78. 1886; Biol. Centr. Amer. Bot. **3**: 534. 1885, nomen nudum. "Mirador, April (*Liebm. n.* 662)." The type, in the Copenhagen Herbarium, has been lent through the kindness of the Director. There is a duplicate type in the U. S. National Herbarium.

DESCRIPTION.

Plants perennial; culms erect, cespitose, slender, glabrous, as much as 50 cm. tall, branching; sheaths glabrous; blades flat, involute above, narrowed to a fine involute point, the blades of the innovations involute, scabrous on the upper surface, glabrous beneath, as much as 20 cm. long and 2 mm. wide; panicle narrow, rather loose, somewhat nodding, 10 to 15 cm. long, the lower branches ascending or appressed, rather distant, as much as 4 cm. long, floriferous from base; glumes about equal, 1 cm. long, 1-nerved, glabrous, or the first scabrous on the keel, obtuse or slightly notched or mucronate at summit; lemma about as long as or a little longer than the glumes, pilose on the callus, scabrous on the upper part of the body and on the flattened somewhat twisted 2 mm. long beak; awns somewhat divergent, sometimes a little contorted at base, the central 1.5 to 2 cm. long, the lateral a little shorter.

DISTRIBUTION.

Savannas of Veracruz, Mexico; also in Guatemala.

VERACRUZ: Mirador, *Liebmann* 662. Minatitlán, *Smith* 568, 590. Without locality, *Liebmann* 665.

GUATEMALA: Los Amales to Izabal, *Blake* 7785.

43. Aristida parishii Hitchc.

Aristida parishii Hitchc. in Jepson, Fl. Calif. 1: 101. 1912. "Type in the U. S. National Herbarium, collected by S. B. and W. F. Parish at Agua Caliente, Colorado Desert, Apr., 1882 (no. 1029a)."

DESCRIPTION.

Plants perennial; culms cespitose, erect, glabrous, 30 to 50 cm. tall; sheaths glabrous, slightly villous at the throat; ligule a short ciliate membrane, the hairs as much as 1 mm. long; blades ascending, firm, flat or more or less involute, scabrous on the upper surface, glabrous beneath, scaberulous toward the involute tip, 15 to 30 cm. long, 1 to 2 mm. wide; panicle narrow, about 15 cm. long, the branches rather stout, stiffly ascending or appressed, the lower 2 to 4 cm. long; glumes somewhat unequal, short-awned, 1-nerved, the first about 12 mm. long, scabrous on the keel, the second 1 to 2 mm. longer, glabrous; lemma about 12 mm. long, the callus about 1 mm. long, pilose, the body glabrous below, gradually tapering above into a short beak, increasingly scabrous on the upper half toward the straight or obscurely twisted summit; awns about equal or the lateral a little shorter, divergent, scarcely contorted, very scabrous from the base, the central about 2.5 cm. long.

DISTRIBUTION.

Dry or rocky soil, Arizona and southern California.

ARIZONA: Sierra Tucson, *Pringle* in 1884. Tucson, *Toumey* in 1892. Yucca, *Jones* in 1884. Congress Junction, *Wooton* 7020. Without locality, *Vasey* in 1889.

CALIFORNIA: Top of Glover Mountain, Colton, *Reed* 1307. San Diego, *Cleveland* in 1882. Palm Canyon, *Johnston* 1008. New York Mountains, Leastalk, *Parish* 10227. Jumpa Hills, Riverside County, *Wilder* 1047½. Newberry, *Chase* 5788½.

44. Aristida curtifolia Hitchc.

Aristida curtifolia Hitchc. Contr. U. S. Nat. Herb. 12: 235. 1909. "Type, *Wright* 736, 1865, no. 559960 in the U. S. National Herbarium, which also bears the secondary numbers 282 and 286." The type locality is uncertain, as there is no indication on the specimen. Our label has printed upon it "Plantae Cubenses Wrightianae" and "Coll. C. Wright, 1865," and bears in script the two numbers 282 and 286. Another label is similar, but omits the year and bears the number 736 only. No. 282 in the Grisebach Herbarium is said to come from "Savannas of Guanacaro, July 28." Wright collected in the vicinity of Habana and Matanzas at this time[31] and the type may have come from the Jata Hills. Guanacaro may be an error for Guanabacoa.

[31] Bull. Torrey Club 32: 298. 1905.

DESCRIPTION.

Plants perennial, the crown hard and woody; culms erect, glabrous, stiff and wiry, 20 to 40 or even 60 cm. tall, the alternate internodes short, thus bringing the leaves together approximately in pairs; sheaths glabrous, short, often only 5 to 10 mm. long, sometimes slightly villous at the throat; blades short, thick, stiffly spreading, flat, or soon involute, scabrous on the upper surface, glabrous beneath, those of the culm mostly 5 to 20 mm. long and 0.5 to 1 mm. wide, the basal ones sometimes longer, the upper ones often much reduced; panicle narrow, nearly simple, 5 to 10 cm. long, the spikelets subsessile or occasionally terminating short erect branches about 5 mm. long; glumes nearly equal, 8 to 9 mm. long, 1-nerved, glabrous except the scabrous upper part of the keel of the first; lemma about 7 mm. long, the callus pilose, nearly 1 mm. long, the body glabrous, tapering into a short straight beak; awns about equal, 10 to 12 mm. long, scabrous, spreading, not contorted at base.

This species is characterized by the wiry stems and the short sharp blades mostly in pairs.

DISTRIBUTION.

Dry slopes, Cuba.

CUBA: Guanabacoa, *Leon* 873, 4645, 7211; *Hitchcock* 498. Rio Sebboruco, *Shafer* 3694. Without locality, *Wright* 736 in part.

45. Aristida portoricensis Pilger.

Aristida portoricensis Pilger in Urban, Symb. Antill. **4**: 100. 1903. "Prope Mayaguez in Monte Mesa, X flor.: *Sintenis* n. 77." A duplicate is in the U. S. National Herbarium.

DESCRIPTION.

Plants perennial; culms cespitose, often in large tufts, more or less branched, slender, glabrous, erect or ascending from a spreading base, 30 to 50 cm. tall; sheaths glabrous, a few long hairs at the throat; blades involute, sparsely beset with long weak hairs on the upper surface, glabrous beneath, somewhat curved or flexuous, mostly 5 to 10 cm. long, scarcely 1 mm. thick when rolled; panicles narrow, loose, few-flowered, mostly 3 to 8 cm. long, the few distant branches rather stiffly ascending, mostly floriferous from the base, bearing a few appressed spikelets, the lower as much as 4 cm. long; glumes unequal, 1-nerved, awn-pointed, the first about 7 mm. long, scabrous on keel and back, the second about 1 cm. long, smooth on the keel, scabrous on the back; lemma about 12 mm. long, including the pilose callus and the scabrous, slightly twisted beak 2 to 3 mm. long; awns about equal or the central a little longer, 2 to 3 cm. long, divergent or horizontally spreading, the base slightly spirally curved or warped.

DISTRIBUTION.

Open stony slopes, on Monte Mesa, near Mayaguez, Porto Rico.

PORTO RICO: Mayaguez, *Chase* 6269, 6298, 6812; *Holm* 40; *Britton, Cowell & Brown* 4361; *Sintenis* 77.

46. Aristida chaseae Hitchc., sp. nov.

DESCRIPTION.

Plants perennial; culms few in a tuft, widely spreading, glabrous, 50 to 60 cm. long; sheaths glabrous, villous at the throat; ligule a ciliate membrane,

less than 0.5 mm. long; blades involute, scabrous and also villous with scattering long hairs on the upper surface, glabrous beneath, 10 to 15 cm. long; panicle narrow, 10 to 15 cm. long, the branches appressed, the lower distant about 5 cm. long; glumes equal or somewhat unequal, 10 to 13 mm. long, acuminate or awn-pointed, the first 1-nerved with a more or less distinct nerve on one side, scabrous on the keel, the second 1-nerved, glabrous; lemma about 11 mm. long, the callus densely short-pilose, the pilose area nearly 2 mm. long, the body purple-mottled, glabrous below, scaberulous on the back from about the middle, narrowed at summit but scarcely beaked; awns equal, somewhat divergent, flat but not contorted at base, very scabrous, about 2 cm. long.

Type in the U. S. National Herbarium, no. 732548, collected on an open stony hill, at Boqueron, Porto Rico, November 12, 1913, by Agnes Chase (no. 6507).

Known only from the type collection. This species differs from *A. cognata*, which it resembles in habit, in the longer glumes, lemma, and awns.

47. Aristida swartziana Steud.

Aristida swartziana Steud. Syn. Pl. Glum. **1**: 137. 1854. "*A. adscensionis* Swartz. obs. p. 40. non Lin." Swartz[32] describes this species under the name *A. ascensionis* "Syst. pl. 229." The culm is described as 1 to 2 feet, decumbent, geniculate, and the glumes as subequal. The glumes of *A. adscensionis* are distinctly unequal. Swartz describes no species of *Aristida* in his later flora[33] and no specimen of *Aristida* was found in his herbarium.[34] Swartz's specimen is said to come from "sabulosis aridis Jamaicae australis." Trinius and Ruprecht[35] discuss *Aristida adscensionis* of Swartz and conclude from the description that it can not be the same as the Linnaean plant, and think it must be *A. cognata* or an allied species. The description, with the exception of geniculate culms, corresponds very well with the specimens cited below. I am therefore taking up Steudel's name for the species.

DESCRIPTION.

Plants perennial, with numerous erect innovations; culms cespitose, erect, glabrous, 40 to 70 cm. tall; sheaths glabrous, villous at the throat; ligule a ciliate membrane, less than 0.5 mm. long; blades involute, scabrous and more or less villous with scattering long hairs on the upper surface, glabrous beneath, mostly erect, as much as 30 cm. long, about 1 mm. wide; panicle narrow, loose and interrupted, as much as 15 cm. long, the branches ascending, 1 to 3 cm. long, usually rather lax, several-flowered; glumes somewhat unequal acuminate, 1-nerved, the first about 7 mm. long, scabrous on the keel, the second about 1 mm. longer, glabrous; lemma about as long as the second glume or a little longer, scaberulous on the keel, strongly pilose on the 0.5 mm. long callus, narrowed into a straight scaberulous beak about 1 mm. long, a faint joint at the summit; awns about equal, ascending, 15 to 25 cm. long.

DISTRIBUTION.

Arid or rocky soil, Jamaica.

JAMAICA: Healthshire Hills, *Harris* 9542. Lititz Savanna, *Harris* 12440. New Forest, southern Manchester, *Hitchcock* 9845. Without locality, *Hart* 864.

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[32] Obs. Bot. 40. 1791.

[33] Fl. Ind. Occ. 3 vols. 1797–1806.

[34] See Hitchcock, Types of American Grasses, The West Indian Grasses described by Swartz. Contr. U. S. Nat. Herb. **12**: 135. 1908.

[35] Mém. Acad. St. Pétersb. Vl. Sci. Nat. **5**[1]: 139. 1842.

48. Aristida cognata Trin. & Rupr.

Aristida cognata Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 127. 1842. "Ins. St. Thomas—Ind. Occ." The type, in the Trinius Herbarium, was sent by Schrader.

DESCRIPTION.

Plants perennial, branching at base, the innovations usually few; culms ascending, glabrous, 20 to 40 cm. tall; sheaths glabrous, villous at the throat or soon glabrate; blades involute, scabrous and villous with scattering long hairs on the upper surface, glabrous beneath, 5 to 15 cm. long, about 1 mm. wide; panicle narrow, loose, 5 to 15 cm. long, the branches rather distant, ascending, mostly closely flowered, 1 to 2 cm. long; glumes unequal, 1-nerved, acuminate, the first 4 to 5 mm. long, scabrous on the keel, the second 1 to 2 mm. longer, glabrous; lemma 6 to 7 mm. long, strongly pilose on the 0.5 mm. long callus, gradually narrowed into a scaberulous beak about 1 mm. long, the summit faintly jointed; awns about equal, ascending, 10 to 15 mm. long.

This species is allied to *A. swartziana*, but differs in the spreading habit with few innovations, the more dense panicle, and the shorter glumes, lemmas, and awns. The different range tends to confirm the segregation of the forms as species.

DISTRIBUTION.

Sterile or rocky hills, Virgin Islands and Montserrat.

VIRGIN ISLANDS: St. Croix, *Benzon.* St. Thomas, *Eggers* 119; *Britton, Britton & Shafer* 119; *Rose* 3189.

WINDWARD ISLANDS: Montserrat, *Shafer* 48, 430.

49. Aristida palustris (Chapm.) Vasey.

Aristida purpurascens β alabamensis Trin. & Rupr. Mém. Acad. St. Pétersh, VI. Sci. Nat. 5[1]: 102. 1842. "Alabama. (V. com. ab ill. *Fisher et Meyer.*)" The type has been examined in the Trinius Herbarium.

Aristida virgata var.? *palustris* Chapm. Fl. South. U. S. 555. 1860. "Margins of pine-barren ponds. West Florida." In the U. S. National Herbarium are three authentic specimens from Chapman.

Aristida palustris Vasey, Descr. Cat. Grasses U. S. 35. 1885. Based on *Aristida virgata palustris* Chapm.

DESCRIPTION.

Plants perennial; culms cespitose from a hard thickened base, glabrous, stiffly erect, rather stout, 1 to 1.5 meters tall; sheaths glabrous, naked at the throat; blades flat, becoming loosely involute, the apex fine and involute, scabrous-pubescent on the upper surface, glabrous beneath, as much as 30 cm. long and 3 mm. wide; panicle narrow and virgate, as much as 50 cm. long, the branches appressed, rather distant but mostly overlapping, the lower as much as 10 cm. long, sometimes naked at base; glumes about equal, mucronate, about 12 mm. long, the first with a distinct nerve on one side (thus 2-nerved), more or less scabrous on the back, scabrous on the keel, the second 1-nerved, glabrous on back and keel; lemma about 8 mm. long, sparingly pubescent on the callus, glabrous on the body, somewhat scaberulous on the straight 1 mm. long beak; awns unequal, the central horizontally spreading, 1.5 to 3 cm. long, the lateral erect, two-thirds to three-fourths as long.

DISTRIBUTION.

Low pine barrens and flatwoods, North Carolina to Florida and west to eastern Texas.

NORTH CAROLINA: Wilmington, *Hitchcock* 323.
SOUTH CAROLINA: Without locality, *McCarthy* in 1884.
GEORGIA: Coffee County, *Harper* 690. Sumter County, *Harper* 644.
FLORIDA: Duval County, *Curtiss* 3425. Fort Myers, *Chase* 4157; *Hitchcock* in 1900. Waldo, *Combs* 688. Fellsmere, *Tracy* 9290. Jacksonville, *Curtiss* 4045, 5182. Tampa, *Nash* 2419. Chipley, *Combs* 549. Avondale, *Combs* 500. Apalachicola, *Biltmore Herb.* 1110a. De Funiak Springs, *Combs* 448.
ALABAMA: Flomaton, *Tracy* 3716, 3720.
MISSISSIPPI: Biloxi, *Kearney* 237; *Tracy* 3071, 3705, 3775. Scranton, *Pollard* 1204. Ocean Springs, *Tracy* 108, 146. Nicholson, *Kearney* 353.
LOUISIANA: Lake Charles, *Tracy* 3706, 3707. Calcasieu, *Cocks* 3002.
TEXAS: "Long-pine belt," *Nealley* in 1885.

50. **Aristida virgata** Trin.

Aristida virgata Trin. in Spreng. Neu. Entd. **2**: 60. 1821. "Hab. in America boreali." The type, in the Trinius Herbarium, is labeled, "Philadelphia. mis. s. n. Aristida racemosa. *Bernhardi.*"

Aristida purpurascens var. *depauperata* Vasey; Beal, Grasses N. Amer. **2**: 201. 1896. "Mississippi, *Tracy.*" In the U. S. National Herbarium is a specimen which I have referred to *A. virgata*, labeled by Vasey "*A. purpurascens* variety, Ocean Springs, Miss., Sept. 2, 1889, *Tracy* 107." A note on the sheet says, "depauperate." This specimen is probably a type or duplicate type of the variety cited above.

Aristida chapmaniana Nash in Small, Fl. Southeast. U. S. 118, 1327. 1903. "Type, Apalachicola, Fla., *Chapman*, in Herb. C. U." The type is in the herbarium of Columbia University, now at the New York Botanical Garden.

DESCRIPTION.

Plants perennial; culms cespitose from a rather slender soft base, erect, glabrous, 50 to 80 cm. tall, sometimes as much as 1 meter; sheaths glabrous, scarcely flattened or keeled; blades flat, rather lax, tapering to a fine point, scabrous on the upper surface, glabrous beneath, as much as 30 cm. long, usually not over 2 mm. wide; panicle slender, erect though not very stiff, rather loosely flowered, one-third to half the entire length of the culm, the branches mostly short and somewhat appressed, mostly 1 to 2 cm. long, not closely overlapping, bearing several approximate spikelets; glumes about equal, 6 to 7 mm. long, acuminate or awn-tipped, the first 1-nerved, sometimes with a weak nerve on one side, scabrous on the keel and on the back, the second glabrous; lemma 4 to 5 mm. long, often mottled, somewhat laterally compressed, glabrous except the short pubescent callus and the very short slightly scaberulous beak; awns unequal, the central horizontally spreading or somewhat reflexed, 1.5 to 2 cm. long, the lateral erect, about two-thirds as long as the central, the base of the central more robust and glabrous on the under side of the curve.

This species differs from *A. longespica* in being perennial and in the glabrous lemma; from *A. purpurascens* in the erect lateral awns. The fruit is distinguished by its size, glabrous surface, and the smooth robust basal curve of the central awn, which is sharply bent, the smaller lateral awns being erect.

DISTRIBUTION.

Moist sandy soil of the Coastal Plain, New Jersey to Florida and Mississippi.

NEW JERSEY: Port Norris, *Holmes* in 1890. Medford, *Commons* 332.
DELAWARE: Georgetown, *Commons* 120.
VIRGINIA: Dismal Swamp, *Chase* 3664.
NORTH CAROLINA: Wilmington, *Canby* in 1867. Southeastern North Carolina, *Ashe* 2219.
GEORGIA: Albany, *Tracy* 3712. Americus, *Tracy* 3708. Meansville, *Harper* 2246.
FLORIDA: Chipley, *Combs* 623. Orange City, *Hood* 4649. Old Town, *Combs* 885. Grasmere, *Combs* 1089, 1165. Crystal, *Combs* 1006. Eustis, *Nash* 1634, 1642, 1682. Jacksonville, *Curtiss* 4046, 5183, 5801. Bay Head, *Combs* 642.
ALABAMA: Mobile, *Mohr* in 1886. Cullman County, *Eggert* 97. Auburn, *Tracy* 3778.
MISSISSIPPI: Nicholson, *Kearney* 346. Waynesboro, *Kearney* 107½, 135, 169. Pass Christian, *Langlois* in 1882. Biloxi, *Tracy* 3072, 3722, 4667. Ocean Springs, *Tracy* 107; *Earle* in 1898. Deer Island, *Tracy* in 1892. Bay St. Louis, *Langlois* in 1883.

51. Aristida torta (Nees) Kunth.

Chaetaria torta Nees, Agrost. Bras. 386. 1829. "Habitat in campis altis provinciae Minarum (*Mart.*)" The type has been examined in the Munich Herbarium. It is labeled "Martius Iter Bras."

Aristida torta Kunth, Enum. Pl. 1: 190. 1833. Based on *Chaetaria torta* Nees.

Aristida tincta Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 111. 1842. The name is based on "*Chaetaria spadicea* Nees * * * non R. & S." *C. spadicea* Roem. & Schult.[36] was based on *Aristida spadicea* H. B. K.[37] from Mexico. Nees[38] described a different species, collected by Martius in Brazil, under this name. The Martius specimen in the Munich Herbarium is therefore the type of *Aristida tincta* Trin. & Rupr.

Aristida breviglumis Mez, Rep. Sp. Nov. Fedde 17: 152. 1921. "Costarica, Buenos Aires (*Tonduz*)." The type is probably one of the two Tonduz numbers cited below.

DESCRIPTION.

Plants perennial; culms cespitose, erect glabrous, 40 to 80 cm. tall; sheaths glabrous; blades erect, flat and firm, becoming involute toward the tip or involute throughout, glabrous beneath, finely scaberulous-pubescent on the upper surface, 15 to 30 cm. long, as much as 3 mm. wide, usually less; panicle narrow, rather dense but interrupted toward base, 8 to 15 cm. long, the branches appressed, branched at base and floriferous nearly to base; glumes nearly equal, the first slightly longer, about 6 mm. long including the short awn about 1 mm. long, usually dark-purple, 1-nerved, the first scabrous on the keel and scaberulous on the back, the second glabrous; lemma about 5 mm. long, including the very short slightly pubescent callus and the straight scaberulous beak about 1 mm. long; awns unequal, the central with a long semicircular curve, 1.5 to 2 cm. long, the lateral about half as long, ascending, somewhat divergent but not recurved-spreading.

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[36] Syst. Veg. 2: 397. 1817.
[37] Nov. Gen. & Sp. 1: 123. 1816.
[38] Agrost. Bras. 385. 1829.

DISTRIBUTION.

Dry plains and grassy hillsides, Costa Rica to Brazil.

COSTA RICA: Buenos Aires, *Tonduz* 3680, 4879.

PANAMA: Ancón, Canal Zone, *Killip* 4197.

BRAZIL: Lagoa Santa, *Warming* in 1864. Curvelho, *Lund* in 1835. Minas, *Glaziou* 17894. Without locality, *Glaziou* 7978, 22568; *Riedel*.

52. **Aristida simpliciflora** Chapm.

Aristida simpliciflora Chapm. Bot. Gaz. **3**: 18. 1878. "Damp pine barrens, West Florida." In the U. S. National Herbarium is a specimen sent to Vasey by Chapman which has been selected as a duplicate type. There are several other sheets from Chapman. One is from the Biltmore Herbarium, marked "Herb. Chapman." Another received through John Donnell Smith is marked "Ex. Herb. Flora of the Southern United States, and Supplement. A. W. Chapman, M. D." The name of the species is inadvertently spelled *A. simplicifolia* by Dr. Vasey.[39]

DESCRIPTION.

Plants perennial; culms cespitose from a rather delicate base, slender, erect, glabrous, 30 to 60 cm. tall; sheaths glabrous, mostly shorter than the internodes; blades flat, with a fine involute point, scabrous on the upper surface and also sometimes beset with scattering long hairs, glabrous beneath, 5 to 15 cm. long, about 1 mm. wide; panicles slender, somewhat nodding, 10 to 20 cm. long, few-flowered, the spikelets mostly in pairs, one long-pediceled, one short-pediceled, scarcely overlapping or the lower pairs distant, the pedicels ascending or laxly appressed; glumes about equal, 6 to 7 mm. long, gradually narrowed to an awn-tipped point, the first scabrous on the keel and back, the second glabrous; lemma a little shorter than the glumes, glabrous except the short-pubescent callus, scaberulous on the scarcely beaked summit; awns somewhat unequal, the central finally reflexed by a semicircular and sometimes contorted bend above the base, about 1.5 cm. long, the lateral awns horizontally spreading, more or less contorted at base, a little shorter than the central one.

This species is distinguished by the slender, almost racemose panicle and the divergent awns, the central with a strong bend above the base.

DISTRIBUTION.

Moist pine woods, western Florida.

FLORIDA: Milligan, *Curtiss* 6911. Walton, ***Curtiss*** **3424***. Apalachicola, *Chapman*. Without locality, *Chapman*, several sheets.

53. **Aristida mohrii** Nash.

Aristida mohrii Nash, Bull. N. Y. Bot. Gard. **1**: 436. 1900. "On sandy ridges. Collected by Dr. Charles Mohr * * * at Spring Hill, Mobile Co., Oct. 4, 1886, and distributed as *A. simpliciflora;* also secured at the same place by B. F. Bush, Aug. 26, 1897, no. 5, and distributed as *A. stricta.*" A duplicate type is in the U. S. National Herbarium.

DESCRIPTION.

Plants perennial; culms erect, sometimes a little geniculate at base, slender, glabrous, 40 to 60 cm. tall; sheaths glabrous, the lower pilose at the throat; blades flat or those of the innovations involute, scabrous on the upper surface,

[39] Contr. U. S. Nat. Herb. **3**: 44. 1892.

the lower also pilose, glabrous beneath, the margins thickened, those of the lower culm mostly 10 to 15 cm. long, 1 to 2 mm. wide, the uppermost reduced; panicle slender and strict, as much as 30 cm. long, the spikelets solitary, appressed, distant, even the upper not overlapping, the pedicles firm, 2 to 3 mm. long; glumes equal, firm, stramineous, rather broad toward the mucronate apex, about 1 cm. long, the first slightly scabrous on the keel toward the summit; lemma terete, glabrous, a little shorter than the glumes, the callus very sharp, about 1 mm. long, pilose, the summit beakless; awns divergent, the central one reflexed by a semicircular bend near the base, 1.5 to 2 cm. long, the lateral ones scarcely shorter than the central, horizontally spreading or reflexed, the bend not markedly semicircular, the base more or less contorted.

This species is allied to *A. simpliciflora* but differs in the solitary distant appressed spikelets, and the longer glumes and lemma.

DISTRIBUTION.

Known only from a single locality near Mobile, where it grows on sands of sterile pine barren ridges.

ALABAMA: Spring Hill, *Mohr*, October 10, 1884, in 1886, in 1891.

54. Aristida tenuispica Hitchc., sp. nov.

DESCRIPTION.

Plants perennial; culms cespitose, slender, glabrous, 60 to 100 cm. tall; sheaths glabrous, somewhat pilose around the throat; ligule a short ciliate membrane, less than 0.5 mm. long; blades flat, narrowed into an involute point, 10 to 20 cm. long, 1 to 2 mm. wide, glabrous beneath, scabrous and bearing scattering long hairs on the upper surface; panicle slender and narrow, about half the entire length of the culm, the branches short and appressed, somewhat distant, few-flowered; glumes nearly equal, somewhat awn-pointed, the first about 8 mm. long, scabrous on the keel, having a lateral nerve on one side, the second a little longer than the first, 1-nerved, glabrous on the keel; lemma about 7 mm. long including the 1 mm. long callus and the 1 mm. long beak, dark colored; awns equal mostly 12 to 15 mm. long. spreading or reflexed, somewhat spirally contorted at base.

Type in the U. S. National Herbarium, no. 990944, collected in "flat woods" [low pine barrens] at Hillsoboro, Florida, October 6, 1898, by Robert Combs (no. 1384).

This species differs from *A. gyrans* in the flat blades, taller culms, shorter callus, and more nearly equal glumes.

DISTRIBUTION.

Low pine barrens, peninsular Florida.

FLORIDA: Cedar Keys, *Combs* 988. Braidentown, *Tracy* 7104. Hillsboro, *Combs* 1360, 1384. Miami, *Chase* 3876. Between Cocoanut Grove and Cutler, *Small & Carter* 572.

55. Aristida condensata Chapm.

Aristida condensata Chapm. Bot. Gaz. **3**: 19. 1888. "Dry sandy soil, West Florida." A duplicate type in the U. S. National Herbarium, sent to Dr. Vasey by Chapman, is from Apalachicola. The lower sheaths are sparsely appressed-villous.

Aristida stricta var. *condensata* Vasey, Contr. U. S. Nat. Herb. **3**: 45. 1892. Based on *Aristida condensata* Chapm.

Aristida combsii Scribn. & Ball, U. S. Dept. Agr. Div. Agrost. Bull. **24**: 43 *f. 17*. 1901. "Type specimen collected by Robert Combs and C. H. Baker, No. 1069, at Grasmere, Florida, September 21, 1898." This specimen, in the U. S. National Herbarium, has glabrous lower sheaths.

DESCRIPTION.

Plants perennial; culms rather robust, erect, glabrous, a meter or more tall; sheaths glabrous, or the lower appressed-villous, usually overlapping; blades firm, flat, becoming involute, especially toward the fine point, scabrous on the upper surface, glabrous beneath, as much as 30 cm. long, 2 to 3 mm. wide; panicle narrow, as much as 30 cm. long, the branches 5 to 10 cm. long, ascending, closely flowered; glumes about equal, 8 to 9 mm. long, acuminate or awn-pointed, 1-nerved, the first scabrous on the keel; lemma terete, about 8 mm. long, the callus over 1 mm. long, very sharp, densely short-pilose, the beak very short, slightly scaberulous; awns about equal, divergent or horizontally spreading, 10 to 15 mm. long, the base more or less contorted, finally forming a loose spiral.

This species has the aspect of *A. lanosa*, but the sheaths are glabrous, except sometimes for a sparse pubescence on the lower ones.

DISTRIBUTION.

Sandy pine or oak barrens, Georgia to Florida and Alabama.

GEORGIA: Montgomery County, *Harper* 1982.

FLORIDA: Eustis, *Nash* 1736; *Chase* 4079. Clarcona, *Meislahn* 81. Miami, *Eaton* 71. Cocoanut Grove, *Small & Carter* 573. Levy County, *Combs* 869. Cedar Key, *Palmer* 613 in 1874. Tampa, *Combs* 1386. Crystal, *Combs* 1015. Old Town, *Combs* 898a. Apalachicola, *Chapman; Biltmore Herb.* 1125. Grasmere, *Combs & Baker* 1069. Bartow, *Combs* 1190.

ALABAMA: Spring Hill, near Mobile, *Mohr* in 1886.

56. Aristida recurvata H. B. K.

Aristida recurvata H. B. K. Nov. Gen. & Sp. **1**: 123. 1816. "Crescit in planitie Orinocensi, amoeno gramine tecta, prope Santo Thomas de la Angostura." The type has been examined at Paris.

Chaetaria recurvata Roem. & Schult. Syst. Veg. **2**: 397. 1817. Based on *Aristida recurvata* H. B. K.

Aristida neesiana Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. **5**[1]: 113. 1842. Based on *Chaetaria recurvata* Nees, not Roem. & Schult. Nees describes[40] a specimen from the Province of Minarum, Brazil. This specimen, in the Munich Herbarium, and a duplicate in the Trinius Herbarium I should refer to *Aristida recurvata* Trin. Trinius and Ruprecht state that *A. neesiana* is similar to *A. recurvata* but differs in certain particulars, such as the length of the glumes and awns. Doell[41] refers *A. neesiana* to *A. recurvata*.

Aristida riedeliana Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. **5**[1]: 114. 1842. "In campis prope Ypanema," Brazil. I have examined the type in the Trinius Herbarium. The awns are spirally contorted at base.

---

[40] Agrost. Bras. 386. 1829.

[41] Mart. Fl. Bras. **2**[3]: 18. 1878.

DESCRIPTION.

Plants perennial; culms cespitose, erect, glabrous, 60 to 100 cm. tall; sheaths numerous at the base of the plant, overlapping, glabrous, those of the culm elongate; blades flat with a long slender involute point, 15 to 30 cm. long, as much as 2 mm. wide, glabrous beneath, faintly scaberulous on the upper surface, the margins smooth, thickened, the old blades often flexuous around the base of the plant; panicle narrow, rather loose, 10 to 30 cm. long, the branches ascending or appressed, branched from base, scabrous, rather densely flowered, the lower as much as 10 cm. long, the lower internodes as much as 3 cm. long, the upper short, the branches, all except the lowermost, overlapping, the main axis scabrous; glumes about equal, the first slightly longer, narrow, 1-nerved, gradually narrowed to an awn-point, about 1 cm. long including the awn, the first scabrous on the keel; lemma about 4 mm. long including the short obtuse pubescent callus, glabrous, the column 2 to 3 mm. long, slightly twisted; awns equal, about 1 cm. long, divergent, the base curved in a warped twist.

DISTRIBUTION.

Prairies and rocky slopes, Panama to Brazil.

PANAMA: Corozal, Canal Zone, *Hitchcock* 9194.
VENEZUELA: Tovar, *Fendler* 1689. Galipán, *Pittier* 6209. Santa Marta, *Smith* 2576.
BRAZIL: Lagoa Santa, *Warming* in 1864. São Paulo, *Löfgren*, 2365. Minas, *Glaziou* 17446, 17895. Without locality, *Riedel*.

57. **Aristida gyrans** Chapm.

Aristida gyrans Chapm. Bot. Gaz. **3**: 18. 1878. "Roberts Key in Caximbos Bay, South Florida." A duplicate type, sent by Chapman to Vasey, is in the U. S. National Herbarium.

DESCRIPTION.

Plants perennial; culms cespitose, erect, slender, glabrous, 40 to 70 cm. tall; sheaths glabrous; blades involute, scabrous or scabrous-pubescent on the upper surface, often beset with scattering long hairs toward the base, glabrous beneath, mostly 10 to 15 cm. long, about 1 mm. wide; panicle slender, rather lax, 15 to 30 cm. long, the branches appressed, not at all or only slightly overlapping, bearing 1 to 3 spikelets or rarely as many as 6; glumes unequal, awn-pointed, the first 7 to 8 mm. long, having a rather faint nerve on one side, usually nearly glabrous on the keel, the second 10 to 11 mm. long, glabrous on the keel; lemma about 6 mm. long, terete, the body glabrous, usually mottled, the callus 1.5 mm. long, sharp, strongly short-pilose, the beak about 0.5 mm. long, at maturity lighter in color than the body, appressed-scaberulous; awns about equal, divergent, 1 to 1.5 cm. long, all about equally contorted at base in a loose spiral.

DISTRIBUTION.

Dry sandy soil, Georgia and Florida.

GEORGIA: Montgomery County, *Harper* 1988.
FLORIDA: Tampa, *Combs* 1389. Fellsmere, *Tracy* 9251, 9316. Brevard County, *Fredholm* 6069. Caxambas Bay, *Chapman*. Braidentown, *Combs* 1289, 1331. Grasmere, *Combs* 1101. Eustis, *Chase* 4060.

58. **Aristida brittonorum** Hitchc., sp. nov.

DESCRIPTION.

Plants perennial; culms rather stout, erect, glabrous, about 60 cm. tall; sheaths glabrous; ligule a ciliate membrane, about 0.5 mm. long; blades firm, involute, scabrous on the upper surface, glabrous beneath, stiffly erect, the basal as much as 20 cm. long and 0.8 mm. in diameter when rolled; panicle narrow, interrupted, 30 cm. long, the branches appressed, the lower as much as 5 cm. long; glumes unequal, acuminate, the first 7 to 10 mm. long, scabrous on back and keel, the second 10 to 12 mm. long, glabrous; lemma about 7 mm. long, the sharp callus 1 mm. long, pubescent, the body glabrous, the beak about 1 mm. long, scabrous; awns about equal, 1.5 to 2 cm. long, all contorted in a loose spiral at base.

Type in the U. S. National Herbarium, no. 907580, collected in white sand in the vicinity of Los Indios, Isle of Pines, Cuba, February 13, 1916, by N. L. Britton, E. G. Britton, and Percy Wilson (no. 14169).

Known only from the type collection.

59. **Aristida rosei** Hitchc., sp. nov.

DESCRIPTION.

Plants perennial; culms cespitose, slender, wiry, glabrous, erect, or somewhat spreading at base, 30 to 50 cm. tall; sheaths glabrous, much shorter than the internodes, villous at the throat; ligule a very short ciliate membrane, less than 0.5 mm. long; blades involute, ascending or spreading, scabrous on the upper surface, glabrous beneath, mostly less than 5 cm. long, sometimes as much as 10 cm. long; panicle narrow, rather lax, 5 to 15 cm. long, the branches and pedicels delicate, somewhat lax or flexuous, ascending or appressed, few-flowered, the lower distant; glumes unequal, 1-nerved, glabrous, even the keels scarcely scaberulous, the first about 5 mm. long, acuminate, the second 1 to 2 mm. longer than the first, acuminate and more or less mucronate; lemma about 6 mm. long, terete, glabrous, the callus rather sparingly short-pilose, 0.5 mm. long, rather blunt, the beak about 0.5 mm. long, smooth; awns about equal, divergent, about 1 cm. long, the base of each contorted in a loose spiral, scarcely roughened, and only minutely scabrous above.

Type in the U. S. National Herbarium, no. 760164, collected at Azua, Santo Domingo [Dominican Republic], March 1, 1913, by J. N. Rose, Wm. R. Fitch, and Paul G. Russell (no. 4027).

This species was referred by Hitchcock and Chase to *Aristida gyrans* Chapm.[42] which also has the base of the awns spirally contorted, but which has a much longer callus and a scaberulous beak. *Aristida rosei* is allied to *A. refracta*, from which it differs in the glabrous first glume and glabrous summit of the lemma. The habit is different, there being no basal tuft of leaves, and the culms are more spreading. Further collections may connect the two species.

DISTRIBUTION.

Dry soil, Hispaniola.

HAITI: Habitation Prince, *Picard* 1554.
DOMINICAN REPUBLIC: Azua, *Rose, Fitch & Russell* 4027.

[42] Contr. U. S. Nat. Herb. **18**: 366. 1917 (Grasses of the West Indies).

60. Aristida refracta Griseb.

Aristida refracta Griseb. Cat. Pl. Cub. 228. 1866. "Cuba occ. (*Wr.* 3431)." A specimen of Wright's no. 3431 is in the U. S. National Herbarium. The type, in the Grisebach Herbarium, consists of three separate, rather short culms, the longest being about 25 cm. long. The awns are distinctly contorted at base.

DESCRIPTION.

Plants perennial; culms usually densely cespitose with numerous innovations, erect, slender, glabrous, 20 to 60 cm. tall; sheaths glabrous, villous at the throat, the leaves usually in a conspicuous basal tuft; blades filiform-involute, glabrous beneath, mostly less than 10 cm. long, the basal tuft 5 to 15 cm. long; panicle narrow, rather lax, 5 to 15 cm. long, the branches ascending, at maturity rather stiff, few-flowered, sometimes as much as 3 cm. long; glumes unequal or nearly equal, 1-nerved, usually mucronate from a notched apex, the first scabrous on the keel, 4 to 5 mm. long, the second glabrous on the keel, usually 1 to 2 mm. longer than the first; lemma about 4.5 mm. long, the callus 0.5 mm. long, short-pilose, the summit scarcely beaked, scaberulous; awns about equal and about 1 cm. long, the base of each more or less contorted.

The specimens referred to this species are rather diverse. Most of them have a conspicuous tuft of filiform basal leaves from the numerous cespitose innovations, the culms short and erect, mostly 20 to 30 cm. tall, mostly naked above the base (such as *Hitchcock* 9853 from Jamaica). The type is a taller plant, with a less evident basal tuft. Several of the specimens seem to have been made by separating the culms of a bunch, in which case the basal tufts of leaves would not be present. In most of the specimens the awns are divergent without much contortion at base, but in the type the contortion is conspicuous. Here and there among the other specimens contorted awns are seen.

DISTRIBUTION.

Dry slopes and pine woods, Cuba, Jamaica, and Porto Rico.

CUBA: Jata Hills at Guanabacoa, *Hitchcock* 231; *Léon* 875, 2641, 4646, 4718, 5605, 5606; *Baker & Hasselbring* 7208. Loma Mencura, *Shafer* 3858. Manacas, *Léon* 5830, 5863, 5874. Woodfred, *Shafer* 2990, 3080. Herradura, *Hitchcock* 233, 499. Sabana de Chirigota, *Léon* 7444, 7454. South of Guane, *Léon* 6971, 8971. West of Guane, *Shafer* 10414. Cajálbana, *Léon* 4846. San Diego de los Baños, *Léon* 4845. Manajanabo, *Léon* 5276. Laguna Jovero, *Shafer* 10718, 10864. Mantua, *Shafer* 11254. Placetas del Sur, *Léon* 8179. Sabana de San Julián de Guane, *Léon* 6942, 7307, 7308. Isle of Pines, *Britton, Britton & Wilson* 15369. Without locality, *Wright* 736 in part, 3430, 3431, 3833, 3834.

JAMAICA: New Forest, southern Manchester, *Hitchcock* 9853. Ashley Hall, Lower Clarendon, *Harris* 12734. Lititz Savanna, Manchester, *Harris* 12433.

PORTO RICO: Guanajibo, *Britton, Cowell & Brown* 4358. Boqueron, *Chase* 6508.

DOUBTFUL SPECIES.

Aristida interrupta Cav. Icon. Pl. 5: 45. *pl. 471. f. 2.* 1799. "Habitat prope oppidum Chalma Regni mexicani." I did not find the cited specimen in the herbarium at Madrid and have not been able certainly to identify the species from Cavanilles's description. Trinius and Ruprecht[46] place the species next

[46] Mém. Acad. St. Pétersb. VI. Sci. Nat. 5[1]: 130. 1842.

to *A. dispersa* (*A. adscensionis*) and say that it seems to be allied to that. Cavanilles's plant is probably a large form of *A. adscensionis*. In good soil that species is as much as 1 meter tall, as indicated in the original description of *A. interrupta*. Trinius and Ruprecht base their conclusions on the original description and the figure, not having seen the type.

Chaetaria interrupta Beauv. Ess. Agrost. 30, 158. 1812. Based on *Aristida interrupta* Cav.

Aristida pallens Nutt. Gen. 1: 57. 1818, nomen nudum. "In depressed situations, near Fort Mandan on the Missouri." No authority is given and it has been assumed that the name was proposed by Nuttall, but the names of authors are frequently omitted in Nuttall's work. It is probable that Nuttall was referring the Fort Mandan plants to *A. pallens* Cav., a South American species with exceptionally long awns. He lists the name again in his Flora of Arkansas Territory.[44] The plants were probably *A. longiseta* Steud.

LIST OF NEW SPECIES AND NEW NAMES.

	Page.
Aristida brittonorum Hitchc., sp. nov	584
Aristida chaseae Hitchc., sp. nov	575
Aristida eggersii Hitchc., sp. nov	560
Aristida glabrata (Vasey) Hitchc	522
Aristida californica glabrata Vasey.	
Aristida longiseta rariflora Hitchc., subsp. nov	565
Aristida neglecta Léon, sp. nov	567
Aristida peninsularis Hitchc., sp. nov	521
Aristida rosei Hitchc., sp. nov	584
Aristida scribneriana Hitchc	566
Aristida lanuginosa Scribn. Not *A. lanuginosa* Clarion.	
Aristida tenuispica Hitchc., sp. nov	581
Aristida ternipes divergens (Vasey) Hitchc	525
Aristida divergens Vasey.	

EXCLUDED SPECIES.

Aristida americana L. Syst. Nat. ed. 10. 2: 879. 1759. This is *Bouteloua americana* (L.) Scribn. The misunderstanding in regard to this species seems to be due to Munro's erroneous statement[45] in his article on the grasses of the Linnaean Herbarium, that *Aristida americana* L. is *A. dispersa* Trin. (*A. adscensionis* L.) Scribner and Merrill[46] accept this statement and use the name *Aristida americana* for that species.

Aristida fuscata Poit.=*Bouteloua americana.*

Aristida antillarum Poir.=*Bouteloua americana.*

Aristida subbiflora Steud.=*Bouteloua americana.*

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[44] Trans. Amer. Phil. Soc. II. 5: 145. 1837.

[45] Proc. Linn. Soc. Bot. 6: 49. 1862.

[46] U. S. Dept. Agr. Div. Agrost. Circ. 32: 5. 1901.

INDEX.

Page numbers of principal entries in heavy-face type. Synonyms in italic.]

Adscensiones 530
Aristida **518**
adscensionis 518, **541**, 542, 576, 586
aequiramea 556
affinis 571
americana 543, 586
bromoides 543
antillarum 586
appressa 568
brevior 568
arizonica 551, **568**, 569
barbata **569**
basiramea **533**
berlandieri 557
beyrichiana 570
breviglumis 579
brittonorum **584**
bromoides 542
californica **521**, 522
fugitiva 521
glabrata 522
major 522
capillacea 530, **540**
chapadensis 554
chapmaniana 579
chaseae **575**
coarctata 542
cognata 561, 576, **577**
combsii 582
condensata **581**
cumingiana 540
curtifolia 567, **574**
curtiseta 556
curtissii 533, **535**
curvifolia **559**
debilis 543
desmantha **519**
dichotoma 530, 533, **534**, 535, 536
curtissii 535
dispersa 542, 586
bromoides 542
coarctata 542
humilis 542
nana 542
nigrescens 542
divaricata **547**, 548, 551
divergens 525
eggersii **560**
elegans 540
elliottiana 571
erecta **570**
fasciculata 542
californica 556
endleriana 561
hookeri 556
micrantha 558
nuttalli 562
fendleriana **561**
filipendula 556
flexuosa 526
floridana 524
fuscata 586
geminiflora **529**
geniculata 539
geyeriana 571
glabrata **522**
glauca **554**
gracilis 530, 539
depauperata 539
grisebachiana 543
decolorata 543
gyrans 581, **583**, 584
havardii **546**, 551
humboldtiana 547, 548
minor 548
humilis 542
hygrometrica 519
hypomegas 526
implexa **553**
aequa 553
intermedia **545**
interrupta 585, 586
jacquiniana 547, 548
jonesii 521
jorullensis **528**
karwinskiana 551
lanata 530, 565
lanosa 530, **565**, 566, 582
lanuginosa 565, 566
leibmanni **573**
lemmoni 548
longespica **538**, 546, 579
longiramea 551
longiseta **562**, 583
hookeri 553
rariflora **535**
robusta **561**
macrochaeta 535
manzanilloana 523
maritima 543
megapotamica 553
micrantha 558

Aristida—Continued. Page.
micropoda 536
mohrii **580**
muhlenbergioides 558
nana 542
nealleyi 554
neesiana 582
neglecta **567**
nigrescens 542
oligantha **536**, 552
nervata 536
orcuttiana 526
orizabensis 568
pallens 517, 586
palmeri 548
palustris **577**
pansa **550**
paraguayensis 553
parishii **574**
patula **550**
pauciflora 536
peninsularis **521**
perennis 565
portoricensis **575**
pseudospadicea 568
pungens 519
purpurascens **571**, 579
alabamensis 577
depauperata 579
glaucissima 572
minor 572
purpurea **556**, 562, 565
aequiramea 556
berlandieri 556, 557
californica 556
capillarifolia 556
fendleri **561**
fendleriana 561
hookeri 556
laxiflora **559**, 565
longiseta 562
micrantha **558**
purpusiana **529**
racemosa 571
ramosissima 530, **538**
uniaristata 538
recurvata **582**
refracta 567, 584, **585**
reverchoni 554
angusta 554
augusta 554, 555
riedeliana 582
roemeriana 558
rosei **584**
sanctae-luciae 540
scabra 523, 550
schaffneri 543
schiedeana **526**
minor 525
scribneriana **566**
setifolia 541
simpliciflora 539, **580**, 581
simplicifolia 539, 580
texana 539
spadicea **551**, 579
spiciformis **552**
squarrosa 552
stipoides 519

Aristida—Continued. Page.
stricta 529, 543, 552, 565, **570**, 571, 580
condensata 582
nealleyi 554
subbiflora 586
subuniflora 561
swartziana **576**, 577
tenuispica **581**
ternipes **523**
divergens **525**
tincta 579
torta **579**
tuberculosa **520**
vaseyi 555
virgata 565, **579**
palustris 577
virletii 526
wrightii **559**
Arthraterum 519
Arthratherum 518
Section of *Aristida* **519**
Bouteloua americana 586
Chaetaria 518, 529
Section of *Aristida* **529**
affinis 571
ascensionis 541
bromoides 542
capillacea 530, 540
capillaris 529, 530, 540
coarctata 542
divaricat 547
fasciculata 542
glauca 554
gossipina 565
humilis 542
interrupta 586
nana 542, 543
olygantha 536
purpurascens 571
recurvata 582
spadicea 551, 579
squarrosa 552
stricta 529, 570
torta 579
tuberculosa 520
Curtopogon 518, 530
dichotomus 530, 534
Cyrtopogon 534
Dichotomae **530**
Divaricatae **530**
Dogtown grass 517, 563
Moulinsia 530
lanosa 566
Muhlenbergia scabra 523
Ortachne 523
floridana 524
pilosa 523, 528
retorta 523
scabra 524
Purpureae **531**
Schistachne 518
Stipa filifolia 553
Stipagrostis, section of *Aristida* 518
Streptachne 518, 523
cubensis 523
floridana 524
pilosa 528
scabra 523, 528
Trixostis 530
gracilis 539
Uniseta, section of *Aristida* 518, **523**

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NEW AMERICAN ASTERACEAE

By S. F. BLAKE

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PREFACE.

The present paper by Dr. S. F. Blake, of the Bureau of Plant Industry, United States Department of Agriculture, contains descriptions of 1 new genus and 118 new species of American Asteraceae. With few exceptions, the new plants here described are from Mexico and Central and South America.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

CONTENTS.

	Page.
Introduction	587
Vernonieae	587
Eupatorieae	587
Astereae	591
Inuleae	596
Heliantheae	596
Helenieae	648
Senecioneae	651
Mutisieae	651
Cichorieae	655
Index	ix

ILLUSTRATIONS.

PLATES.

Facing page.

PLATE 54. *Stevia tephrophylla* Blake 662
55. *Gutierrezia grandis* Blake 662
56. *Erigeron maxonii* Blake 662
57. *Achyrocline crassiceps* Blake 662
58. *Parthenium densipilum* Blake 662
59. *Flourensia hirtissima* Blake 662
60. *Verbesina baccharidea* Blake 662
61. *Calea ovalis* Blake 662
62. *Trichocoryne connata* Blake 662
63. *Proustia cuneata* Blake 662

FIGURES.

FIGURE 87. Details of *Trichocoryne connata* 649

NEW AMERICAN ASTERACEAE.

By S. F. Blake.

INTRODUCTION.

The new species of Asteraceae described in this paper are for the most part the result of several years' work in the identification of material of this family in the National Herbarium. A few are based on material in the Gray Herbarium, the herbarium of the Field Museum of Natural History, and the herbarium of the New York Botanical Garden. In most cases the new species have been worked up in connection with the preparation of preliminary keys for the genera concerned or keys to the species of definite regions, particularly Mexico and northern and western South America.

VERNONIEAE.

Vernonia durangensis Blake, nom. nov.

Eremosis ovata Gleason, Bull. Torrey Club **40**: 331. 1913. Not *Vernonia ovata* Less. 1829.

Vernonia gleasoni Blake, Contr. Gray Herb. n. ser. **52**: 17. 1917. Not *V. gleasonii* Ekman, Ark. för Bot. **13**[15]: 54. 1914.

Vernonia stellata (Spreng.) Blake.

Conyza stellata Spreng. Neu. Entd. **2**: 142. 1821.

Vernonia oppositifolia Less. Linnaea **4**: 273. 1829.

Excellent specimens of this species, remarkable for its opposite leaves, are in the National Herbarium, collected in the State of Rio de Janeiro, Brazil, in 1921 by E. W. D. and Mary M. Holway (nos. 1036, 1168, 1233).

EUPATORIEAE.

Jaliscoa pappifera Blake, sp. nov.

Herbaceous above, 1.6 to 2.5 meters high; stem rather stout, ternately branched above, obscurely appressed-puberulous; leaves ternate on the stem, opposite on the branches; petioles slender, naked, obscurely puberulous, 3 to 25 mm. long; leaf blades ovate or broadly ovate, 5 to 15.5 cm. long, 2.2 to 10.5 cm. wide, acuminate, at base cuneate, membranaceous, crenate-serrulate with rounded or acute mucronulate teeth above the base, above obscurely puberulous on the nerves and sometimes on surface, beneath equally green, obscurely incurved-puberulous along the veins or subglabrous, triplinerved above the base, the chief veins prominulous beneath; heads very numerous at apex of stem and branches, the individual dense cymose panicles 4 to 8 cm. wide; pedicels slightly puberulous, 3 mm. long or less; heads about 9 mm.

high, 14 or 15-flowered; involucre sub-2-seriate, 3.5 mm. high, subequal, the phyllaries linear, greenish, obtuse or acutish, incurved-puberulous and ciliolate; corollas whitish (?), glabrous, 4.8 mm. long; achenes linear-prismatic, 4-angled, hispidulous above, 2.5 mm. long; pappus a lacerate-fimbriate crown about 0.3 mm. high.

Type in the U. S. National Herbarium, no. 460316, collected on bluffs of a barranca near Cuernavaca, Morelos, Mexico, altitude 1,370 meters, November 23, 1902, by C. G. Pringle (no. 9931). Also collected by Pringle (no. 6158) in the same locality, November 10, 1895, at an altitude of 1,525 meters.

The only species of the genus previously known, *Jaliscoa pringlei* S. Wats., which has been found only at Guadalajara, Jalisco, is distinguished by its sharply serrate leaves, which are loosely glandular-puberulous beneath, and by the reduction of its pappus to an obscure entire callous border. When more specimens are collected, *J. pappifera* may prove to connect with *J. pringlei*, but the material now at hand shows no sign of intergradation. The stems of both species are always more or less riddled by elliptical holes, undoubtedly made by weevils, which sometimes extend quite through the stem.

Ageratum elassocarpum Blake, sp. nov.

Herbaceous above, probably suffrutescent below, the base not seen; stem slender, simple or branched above, 40 cm. high and more, terete, densely puberulous with incurved hairs with somewhat swollen subglandular bases; internodes 1.5 to 8.5 cm. long; leaves opposite, or the upper sometimes alternate; petioles naked, flattened above, densely incurved-puberulous, mostly 7 to 17 mm. long; leaf blades ovate or triangular-ovate, 4 to 7 cm. long, 1.5 to 3 cm. wide, narrowed to an obtuse apex, cuneate at base, crenate-serrate (teeth blunt, about 10 pairs), firm-papery, above dull green, densely scabrid-puberulous with subtuberculate-based, mostly deciduous hairs, beneath dull green, densely dotted with dull glands and minutely puberulous (the hairs longer along the veins), impressed-veined above, triplinerved above the base and loosely prominulous-reticulate beneath; peduncles terminating stem and branches, 2 to 6 cm. long, bearing 11 to many heads in a close cymose panicle 2 to 4.5 cm. wide, the incurved-puberulous and somewhat glandular pedicels 2 to 6 mm. long; heads about 5 mm. high, 2 mm. thick, about 31-flowered; involucre 2-seriate, equal, 3 mm. high, the firm linear phyllaries strongly 2-ribbed, incurved-puberulous, acuminate, callous-pointed; receptacle paleaceous, the pales narrowly linear, acuminate, somewhat glandular, sparsely lacerate-ciliate, 3 mm. long; corollas sparsely glandular-pubescent, 2 mm. long; achenes prismatic, 5-angled, narrowed at base, glabrous, blackish, 1.3 mm. long; pappus coroniform, denticulate, 0.2 mm. long.

Type in the U. S. National Herbarium, no. 567021, collected on the Sierra de Tonalá, Chiapas, Mexico, September, 1913, by C. A. Purpus (no. 6628).

A member of the section *Coelestina*, related to *Ageratum salicifolium annectens* Blake, but readily separated by its ovate, merely crenate leaves. From *A. paleaceum* and *A. albidum*, the two Mexican species of *Coelestina* with paleaceous receptacle included in Robinson's revision of the genus,[1] it is readily distinguished by the fact that the leaves are not tomentose beneath. The type was distributed as *A. corymbosum* Zuccagni.

Ageratum salicifolium annectens Blake, subsp. nov.

Receptacle paleaceous except in the center with linear-subulate pales, these about 5 mm. long, 0.3 mm. wide, bearing a few hairs toward tip; otherwise exactly as in the typical form.

Type in the U. S. National Herbarium, no. 382086, collected on mountain side above Cuernavaca, Morelos, Mexico, altitude 1,830 meters, October 19, 1900, by C. G. Pringle (no. 9045).

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[1] Proc. Amer. Acad. 49: 468. 1913.

An interesting form, connecting the two primary groups into which the section *Coelestina* is divided by Dr. B. L. Robinson in his revision of the genus. The specimen of the same number in the Gray Herbarium has the naked receptacle characteristic of true *A. salicifolium* Hemsl., but is indistinguishable from the specimen in the National Herbarium in any other character that I have been able to discover. Apparently the case is strictly comparable with that of the presence or absence of pappus in otherwise indistinguishable forms found in various genera of Asteraceae, and particularly in the Verbesininae.

Stevia flourensioides Blake, sp. nov.

Shrub 35 cm. high and probably much more, oppositely branched, strongly viscid, the stem stoutish, brownish-barked, glabrous below, incurved-puberulous with sordid hairs above especially in the region of the inflorescence; leaves opposite, often bearing short leafy branches in their axils; blades elliptic or oblong-elliptic, 3.5 to 6 cm. long, 5 to 16 mm. wide, acute to obtuse, cuneately narrowed into a petioliform, narrowly margined base 1.5 to 4 mm. long, entire, thick, coriaceous, dotted, obscurely feather-veined, glabrous except for a light ciliolation; heads in dense clusters at the tips of the ternately arranged branches of the panicle, forming a flattish or convex corymbiform panicle usually 4.5 to 6.5 cm. wide, bracted with small leaves; involucre 7 to 8 mm. high, the phyllaries 5, firm, greenish, brownish toward apex, linear-oblong, obtuse to acute or short-acuminate, viscid and sparsely ciliolate toward apex; flowers 5 or 6; corollas white, 7 to 8 mm. long, glandular essentially throughout; achenes (scarcely mature) 5-angled, hispidulous, 3 to 3.8 mm. long; pappus a crown of fimbriatulate, more or less united squamellae 0.2 mm. long or less.

Type in the U. S. National Herbarium, no. 570301, collected on Mount Ixtaccihuatl, State of Mexico, Mexico, altitude 3,355 to 3,660 meters, on rocks, January, 1906, by C. A. Purpus (no. 1470).

The type collection was distributed as *Stevia vernicosa* Greenm., which has smaller serrulate leaves and a pappus of squamellae and long awns. *S. flourensioides* is readily distinguished by its entire, very viscid, subsessile leaves and its very short pappus.

Stevia integra Blake, sp. nov.

Fruticose, 25 cm. high or less, with few opposite branches; stem brownish, incurved-puberulous above especially in the inflorescence, glabrous below; leaves opposite, or the upper alternate; blades elliptic or elliptic-obovate, 17 to 25 mm. long, 4.5 to 9 mm. wide, acute or obtusish, narrowed into a narrowly margined petioliform base 5 to 8 mm. long, thick, entire, triplinerved or 1-nerved, dotted, at first sparsely incurved-pubescent, soon glabrous or sparsely pubescent merely on the costa beneath; peduncle 2.5 to 3.5 cm. long; panicles dense, flattish, corymbiform, 1 to 2.8 cm. wide; heads 9 mm. high, 5-flowered; involucre 6 mm. high, the phyllaries 5, linear-elliptic, obtuse, green, sparsely puberulous with glanduliform hairs; corollas white, stipitate-glandular chiefly below, 6 to 6.5 mm. long; achenes 5-angled, hispidulous, 3.8 mm. long; pappus of about 7 oblong, obtuse, sparsely denticulate, more or less united squamellae 0.5 to 1.4 mm. long, rarely also with a single awn 4.8 mm. long.

Type in the U. S. National Herbarium, no. 842014, collected on the Sierra de la Paila, Coahuila, Mexico, October, 1910, by C. A. Purpus (no. 4722).

Distinguished among the shrubby species of the genus by its small, elliptic or elliptic-obovate, strictly entire leaves with obscure veins, and by the lack of any marked viscidity.

Stevia pelophila Blake, sp. nov.

Slender perennial herb, erect, 30 cm. high, simple below the inflorescence; root apparently short, with many elongate fibrous rootlets; stem glabrous below, sparsely appressed-puberulous above; middle internodes 1.8 to 4 cm. long; leaves opposite below the inflorescence, linear, 2.5 to 3.8 cm. long, 1 to 1.8 mm. wide, obtuse, sessile, fleshy, entire, glabrous, 1-nerved, mostly erect; heads 2 to 5 at apex of stem and of

the few short branches, on pedicels 2 to 12 mm. long; heads slender, 14 mm. high, 5-flowered; involucre subequal, 7 mm. high, the phyllaries 5, linear-oblong, obtuse to subacuminate, obscurely ciliolate, otherwise glabrous, purplish-tinged, with indurate center and thin margins, 3-nerved; corollas flesh-colored, 8.5 mm. long, the tube and throat tubular-funnelform, sparsely glandular and pubescent, the tube 0.5 mm., the throat 5 mm. long, pilose within at apex with several-celled hairs, the 5 teeth oval-ovate, obtuse, 2-nerved, 3 mm. long, 1.2 mm. wide; achenes (submature) slender, hispidulous above, 5.5 mm. long; pappus of 3 narrowly subulate, hispidulous, purplish-tinged awns 5 mm. long, narrowly paleaceous-margined toward base, and about 7 unequal oblong lacerate squamellae about 0.8 mm. long.

Type in the U. S. National Herbarium, no. 1,038,785, collected in the State of Durango, Mexico, altitude 100 meters, in mud, by P. Ibaña García (no. 387).

Stevia tephrophylla Blake, sp. nov. PLATE 54.

Shrub about 25 cm. high, oppositely branched, the stem stout, like the branches densely cinereous-tomentulose; leaves opposite, longer than the internodes, often with fascicles in their axils, the blades ovate to oval, 15 to 20 mm. long, 7 to 13 mm. wide, obtuse, cuneately and rather abruptly narrowed into margined petioles 3 to 5 mm. long, crenulate, thick-herbaceous, triplinerved or penninerved with the nerves conspicuous especially beneath, above cinerascent green, lightly tomentulose, glabrescent, beneath very densely cinereous-tomentulose; peduncles short, about 1.5 cm. long; heads very numerous and densely crowded, the cymose panicles convex, about 2.8 cm. wide; heads 6.5 mm. high, 7 or 8-flowered; involucre 4.8 mm. high, the phyllaries 6 to 8, densely cinereous-tomentulose, somewhat unequal, linear, acute to obtuse or apiculate; corollas white, glandular throughout, 4 mm. long; achenes brownish black, 5-angled, hispidulous on the angles, 1.4 to 1.8 mm. long; pappus of about 6 lacerate squamellae 0.3 mm. long, and 2 or 3 bristle-like, unequal or equal awns about 3 mm. long.

Type in the U. S. National Herbarium, no. 470841, collected at Los Pinos, Chiapas, Mexico, June 2, 1904, by E. A. Goldman (no. 1047).

Readily distinguished among the shrubby species of the genus by its small leaves, which are densely canescent-tomentulose beneath, and its densely canescent-tomentulose involucre.

EXPLANATION OF PLATE 54.—*Stevia tephrophylla*, from the type specimen. Natural size.

Fleischmannia standleyi Blake, sp. nov.

Herbaceous perennial, with procumbent stem and ascending branches 25 to 50 cm. high, rather densely pilose with loose several-celled wide-spreading hairs, and stipitate-glandular; leaves alternate; petioles narrowly margined above, pubescent like the stem, 1.5 to 3 cm. long; blades ovate, 2 to 4 cm. long, 1.7 to 2.7 cm wide, acute or obtuse, mucronulate, at base rounded or cuneate-rounded and often unequal, unequally 4 to 6-toothed on each side or sometimes 3-lobed (the lobes oblong to deltoid, few-toothed, with mucronulate teeth), membranaceous, equally green both sides, quintuplinerved at base, sparsely and loosely pilose chiefly on the costa and margin; heads solitary in the axils and at tip of stem, on stipitate-glandular and sparsely pilose peduncles 3 to 10.5 cm. long; disk subhemispheric, 8 to 9 mm. high, 8 to 11 mm. thick; involucre 6 to 7 mm. high, graduate, about 5-seriate, the phyllaries ovate to (innermost) linear-lanceolate, acuminate, with green or sometimes purplish-tinged, about 3-ribbed central portion, and narrower pale scarious margins, glabrous or the outermost slightly glandular-puberulous; flowers very numerous; corollas white or purplish-tinged, glabrous, 4.8 mm. long, very slender; styles exserted about 3 mm.; achenes (immature) sparsely hispidulous, 1.7 mm. long; awns 5 to 7, bristle-form, minutely hispidulous, about 4.5 mm. long, alternating with several minute bristle-form squamellae.

Type in the U. S. National Herbarium, no. 635891, collected high up in the Sierra de los Álamos, Sonora, Mexico, March 19, 1910, by J. N. Rose, P. C. Standley, and P. G. Russell (no. 13073).

ADDITIONAL SPECIMEN EXAMINED:

SINALOA: In moist places, Cerro de la Silla, San Ignacio, altitude 1,100 meters, April 20, 1918, *Montes & Salazar* 288.

Kuhnia triplinervis Blake, sp. nov.

Herb 65 cm. high, erect-branched above the middle, the root not seen; stem stoutish, minutely appressed-puberulous, leafy; leaves alternate, often with fascicles in their axils; petioles 3 mm. long to none; leaf blades lanceolate, the larger 6 to 7.5 cm long, 1 to 2 cm. wide, acuminate, often falcate, acutely cuneate at base, entire or sparsely serrate, submembranaceous, above deep green, scabrid with minute tuberculate-based hairs (somewhat larger toward the margin), somewhat gland-dotted, beneath equally green, minutely hispidulous along the veins, gland-dotted, triplinerved above the base, the veins prominulous beneath; heads numerous, in subumbellate clusters of 2 to 8 at tips of branches, nodding, about 24-flowered, the pedicels 5 to 10 mm. long, densely and minutely puberulous, setaceous-bracted; disk about 1.5 cm. high, 1 cm. thick; involucre about 4-seriate, graduate, 10 mm. high, the phyllaries lance-subulate (outer) to linear, attenuate (outer) to acuminate or acute, the inner sometimes apiculate, green or purplish, with 2-nerved central portion and narrow thin margins, on back minutely puberulous or the inner subglabrous, ciliolate, the extreme tips rather loose; corollas apparently pale yellowish, glabrous, cylindric, 6.5 to 7.5 mm. long (tube 2.2 to 2.8 mm., throat 4 to 4.2 mm., teeth ovate, obtuse, 0.5 to 0.8 mm.); anthers coherent; achenes nearly linear, hispidulous, about 15-striate, 6 mm. long; pappus bristles about 25, plumose, golden brown at least at base, flexuous, 6 mm. long.

Type in the U. S. National Herbarium, no. 332873, collected 15 miles south of Guadalupe y Calvo, Sierra Madre of southwestern Chihuahua, Mexico, altitude 2,285 to 2,440 meters, August 22, 1898, by E. W. Nelson (no. 4825).

Distinguished from its nearest relative, *Kuhnia oreithales* Robinson, by its comparatively broad triplinerved leaves and larger heads, with more numerous flowers. The heads tinge the water in which they are boiled a pale yellow.

ASTEREAE.

Gutierrezia digyna Blake, sp. nov.

Suffrutescent perennial, several-stemmed, 30 cm. high; stems slender, striatulate, somewhat granular, simple below the inflorescence; internodes 4 to 7 mm. long; leaves alternate, often with small fascicles in their axils, the lower oblanceolate, 2.5 to 3.5 cm. long, 3 to 4.5 mm. wide, acute or acutish, callous-apiculate, narrowed to the sessile base, subcoriaceous, 1–nerved, glandular-punctate, sparsely tuberculate on margin, the middle and upper chiefly linear, 1.3 to 3 cm. long, 1 to 2.5 mm. wide; heads subcylindric, 3.5 to 5 mm. high, 1.5 mm. thick, in flattish-topped, densely fastigiate, cymose panicles 3.5 to 6 cm. wide, the pedicels usually wanting, at most 2.5 mm. long; involucre about 4–seriate, graduate, 3.5 mm. high, the phyllaries few (about 9), broadly ovate (outer) to oblong, obtuse to truncate, with indurate body, subscarious margin, and thicker, pale green apex, at apex glandular-granular and often sparsely ciliate; receptacle convex, fimbrillate; rays 2, yellow, the lamina oval, entire, revolute, 2 to 2.8 mm. long, 1.3 mm. wide; disk corollas 2 to 4, yellow, funnelform, glabrous, 3.8 mm. long; ray achenes (immature) turbinate, silky-pilose, 1.3 mm. long, their pappus of about 12 unequal lacerate squamellae, up to 0.8 mm. long; disk achenes apparently infertile, their pappus up to 1.1 mm. long; style branches of disk flowers linear, obtuse, hispidulous, without evident stigmatic lines.

Type in the U. S. National Herbarium, no. 233050, collected at base of the San Luis Mountains, up to 1,830 meters altitude, in Sonora, Mexico, along the Arizona-Sonora boundary line, September 5, 1893, by E. A. Mearns (no. 2100).

Nearest *Gutierrezia glomerella* Greene, which has linear-filiform leaves 1 mm. wide or less, and glomerulate heads with one ray and one or two disk flowers.

Gutierrezia dracunculoides (DC.) Blake.

Brachyris dracunculoides DC. Mém. Soc. Phys. Hist. Nat. Genève 7: 265. *pl. 1*. 1836; Prodr. **5**: 313. 1836.

Brachyris dracunculoides β angustissima DC. Mém. Soc. Phys. Hist. Nat. Genève 7: 268. 1836; Prodr. **5**: 313. 1836.

Brachyris ramosissima Hook. Icon. Pl. 2: *pl. 142*. 1837.

Amphiachyris dracunculoides Nutt. Trans. Amer. Phil. Soc. n. ser. 7: 313. 1840.

Gutierrezia lindheimeriana Scheele, Linnaea **22**: 351. 1849.

The genus *Amphiachyris* of Nuttall,[2] based on the section of *Brachyris* described by DeCandolle[3] under the same name, was founded on this species. The genus was later extended by Gray[4] to include the plant earlier described as *Amphipappus fremontii* Torr. & Gray, and as thus constituted was distinguished from *Gutierrezia* by no essential characters beyond its sterile disk florets and pappus of subaristiform paleae more or less dilated and united at base. Of the two species included by Gray, one, *A. fremontii*, offers strong differential characters in habit, heads, involucre, and pappus, and should be restored to independent rank (*Amphipappus* Torr. & Gray), as has been done by Rydberg in his Flora of the Rocky Mountains and Adjacent Plains, and by the writer in his manuscript treatment of the Asteraceae for Mr. Ivar Tidestrom's flora of the States of Utah and Nevada. The other, *A. dracunculoides*, type of the genus *Amphiachyris*, seems best referred to *Gutierrezia*. It has precisely the habit and involucre of the annual species of that genus, and the supposedly diagnostic characters above mentioned break down when all the species of *Gutierrezia* are considered. In various species of the latter genus the disk achenes are more or less completely infertile, as for instance in *G. digyna* above described. In *G. sphaerocephala* A. Gray, although the pappus consists of squamellae rather than awns, these are connate at base for often half their length or more. On the whole, the lack of any sharply diagnostic characters which can be considered of generic value, and the entire agreement in habit with *Gutierrezia*, show that *Amphiachyris* should be referred to *Gutierrezia*.

Gutierrezia grandis Blake, sp. nov. PLATE 55.

Suffrutescent, 30 cm. high and more, sparsely erect-branched; stem slender, gray-barked, glabrous; branches greenish, striatulate, finely tuberculate, leafy; leaves alternate, often with fascicles in their axils, oblanceolate or linear-oblanceolate, 2 to 5 cm. long, 2 to 6 mm. wide, callous-apiculate at the obtuse or acute apex, narrowed to the sessile base, entire, subcoriaceous, evenly but rather sparsely tuberculate-hispidulous all over or only on margin and veins, triplinerved (the lateral pair weak), glandular-punctate; heads turbinate or cylindric-turbinate, about 10 mm. wide, solitary at tips of branches and branchlets on pedicels 5 to 10 mm. long, or more often densely cymose-panicled and sessile or on shorter pedicels, in glomerules of 2 to 5, the panicles 1.5 to 4.5 cm. wide; disk 6 to 7 mm. high, 2 to 4 mm. thick; involucre about 5-seriate, graduate, 5 to 6 mm. high, the phyllaries ovate-oblong (outer) to oblong, obtuse or the inner acutish, appressed, with indurate body, thinner subscarious margins, and rather conspicuous short green tip, glandular-viscid at apex, the inner sometimes slightly ciliate; receptacle alveolate; rays 5 to 9, yellow, the

[2] Trans. Amer. Phil. Soc. n. ser. 7: 313. 1840.

[3] Mém. Soc. Phys. Hist. Nat. Genève 7: 268. 1836.

[4] Proc. Amer. Acad. 8: 632. 1873.

lamina oval, entire, 4 mm. long, 2 mm. wide; disk corollas 3 to 7, yellow, funnel-form-campanulate, glabrous, 4 mm. long; ray achenes turbinate, densely pilose, 1.7 mm. long, their pappus of about 10 oblong obtuse fimbriate squamellae, about 0.8 mm. long; disk achenes similar, fertile, 1.5 mm. long, their pappus similar, 1 mm. long.

Type in the U. S. National Herbarium, no. 573304, collected at head of Cañon de las Barretas, in the Sierra Madre, near Icamole, Nuevo León, Mexico, February 3, 1907, by W. E. Safford (no. 1257).

ADDITIONAL SPECIMEN EXAMINED:

COAHUILA: Sierra de Parrás, altitude 2,745 to 3,050 meters, July and October, 1910, *Purpus* 4564.

Distinct in its comparatively large heads and relatively broad, distinctly triplinerved leaves. The two collections made by Purpus were distributed as *G. euthamiae* Torr. & Gray [=*G. sarothrae* (Pursh) Britton & Rusby], which has much narrower leaves and smaller heads.

EXPLANATION OF PLATE 55.—*Gutierrezia grandis*, from the type specimen. Natural size.

Laestadia costaricensis Blake, sp. nov.

Fruticulose, cespitose, prostrate and rooting, branched, the slender, very leafy, sparsely incurved-puberulous and subglandular stems 6 to 25 cm. long; leaves alternate, narrowly spatulate or linear-oblanceolate, 6 to 11 mm. long, 0.8 to 2.5 mm. wide, acute or acutish and callous-apiculate, gradually narrowed into a petioliform base, entire, somewhat fleshy, often slightly ciliate, with a few long several-celled hairs on both surfaces, glandular-punctate; peduncles terminal becoming apparently axillary, monocephalous, pubescent like the stem, sparsely bracted, 2 to (maturity) 6.5 cm. long; heads depressed-subglobose, disciform, 3 mm. high, 6 mm. thick; involucre about 3-seriate, subequal, 3 mm. high, the phyllaries linear, acute or the inner obtusish, appressed, glandular, somewhat lacerate-ciliate, the outer subherbaceous, with dark midrib and very narrow thin margins, the inner broadly subscarious; outer flowers numerous, pistillate, their corollas densely covered with club-shaped glandular hairs, 0.9 mm. long (tube 0.3 mm., throat campanulate, 0.3 mm., teeth lance-ovate, recurved, 0.3 mm. long), their achenes oblong-obovoid, about 6-ribbed, glandular at base and apex, 1.3 to 1.5 mm. long, bearing at the somewhat contracted apex a thick callous cup 0.2 mm. high; disk corollas numerous, stipitate-glandular, 2.2 mm. long (tube cylindric, 1.2 mm., throat and limb globose-campanulate, the 5 teeth ovate, acutish, 0.6 mm. long), their achenes (sterile?) similar to those of pistillate flowers, 6 or 8-ribbed, 1 mm. long.

Type in the U. S. National Herbarium, no. 939349, collected on the Cerro de las Vueltas, Costa Rica, altitude 3,000 meters, January, 1897, by H. Pittier (no. 10500).

Nearest to *Laestadia lechleri* Wedd., as which it has been identified, but that is described as having the leaves and involucre glabrous. The genus has apparently not previously been recorded from Central America.

Bellis garciae Blake, sp. nov.

Perennial, several-stemmed; stems simple, monocephalous, erect or ascending, 25 cm. high, hispid-pilose with ascending or appressed hairs; leaves alternate, the lowest very narrowly linear-oblanceolate, 4 cm. long, including the margined petiole, 3 mm. wide, sparsely strigose; other leaves linear, gradually reduced above, 1.5 to 2.5 cm. long, 1 to 2 mm. wide, acute, subsessile, hispid-ciliate, otherwise essentially glabrous, 1-nerved; peduncles about 5 cm. long, naked or bearing 1 or 2 filiform bracts; heads 1.8 to 2.3 cm. wide; disk subglobose, 6 mm. high, 10 mm. thick; involucre 3-seriate, 4 mm. high, subequal, the phyllaries linear-lanceolate, acuminate, sparsely hispid, with dark center and narrow, somewhat lacerate-ciliate, scarious margin, sometimes purplish-tinged at apex; rays about 100, white, the lamina 6 to 8 mm. long, 0.5 to 0.7 mm. wide, bidentate; disk corollas yellow, becoming purplish on the teeth in age, pubescent toward base of throat, 2.2 mm. long;

achenes obovoid, 1 mm. long, compressed, sparsely hispidulous, whitish, with thickened margins, epappose.

Type in the U. S. National Herbarium, no. 1,038,782, collected in the State of Durango, Mexico, altitude 1,000 meters, by P. Ibaña García (no. 310).

Related to *Bellis purpurascens* Robinson, which has elliptic to obovate-elliptic leaves 6 to 12 mm. wide, fewer and broader phyllaries, these very sparsely pubescent on the midline, and much fewer and broader rays.

Bellis mima Blake, sp. nov.

Herbaceous perennial, few-stemmed, 38 to 50 cm. high, the root not seen; stems rather stout, simple, greenish, striatulate, very sparsely pilose with chiefly spreading hairs; basal leaves few, their petioles essentially glabrous, 6 to 9 cm. long, the blades elliptic or obovate-elliptic, 10 to 11.5 cm. long, 2.3 cm. wide, obtuse, apiculate, long-cuneate at base, entire, fleshy, subpergamentaceous when dried, glabrous, marginate, equally green on both sides, feather-veined, the veins 4 or 5 pairs, anastomosing, scarcely prominulous; stem leaves 8 to 14, linear-lanceolate or linear, hirsute-ciliate and often with a few hairs beneath, the lower 5 to 6 cm. long, 4 to 6 mm. wide, gradually reduced above, the uppermost about 1 cm. long, 1 mm. wide; peduncles solitary, terminal, monocephalous, elongate, spreading-pilose, somewhat enlarged just below the heads; heads 3.2 to 4.5 cm. wide; disk 7 to 10 mm. high, 1.2 to 2 cm. thick; involucre about 2-seriate, equal, 7 mm. high, the phyllaries linear, acute or acuminate, with thickened midrib, subherbaceous, thin-margined below, with erect or spreading purplish-tinged tips, rather sparsely pilose, ciliolate above; rays about 60, white, fertile, the tube sparsely pilose with several-celled subglandular hairs, the lamina linear, 3-denticulate, about 12 mm. long, 1.8 mm. wide; disk corollas yellow, sparsely pilose with several-celled subglandular hairs, 3.5 mm. long (tube 0.8 mm., throat funnelform, 2 mm., teeth ovate, with a vertical apical crest, 0.7 mm. long); achenes of ray and disk similar, oblong, compressed, 2-nerved, glabrous, subtruncate, 2 mm. long; pappus none; style branches of hermaphrodite flowers with triangular acute hispidulous appendages equaling the stigmatiferous portion.

Type in the U. S. National Herbarium, no. 332836, collected in the Sierra Madre, 30 miles north of Guanacevi, Durango, Mexico, altitude 2,440 to 2,745 meters, August 18, 1898, by E. W. Nelson (no. 4786).

This species, very distinct in its great size, large and entire, glabrous basal leaves, much smaller, ciliate stem leaves, and large heads, is named from its superficial resemblance to *Aplopappus stoloniferus* DC.

Erigeron maxonii Blake, sp. nov. PLATE 56.

Suffrutescent, subsimple or sparsely branched, about 30 cm. high, the base not seen; stem ascending, stoutish, purplish, sparsely hirsute-pilose and puberulous with mostly appressed or ascending hairs, leafy; leaves alternate, often with fascicles in their axils, spatulate-oblanceolate or oblanceolate, 2 to 4.5 cm. long, 3 to 10 mm. wide, obtuse or acute, callous-apiculate, cuneately narrowed into the petioliform base, remotely serrate-lobed about to middle (the teeth 2 to 3 pairs, obtuse or acute, callous-tipped), firm, somewhat fleshy, rather pale green, evenly but not densely hirsute-pilose on both sides and ciliate (the hairs of the upper surface with small tuberculate bases), weakly penninerved, the upper usually much smaller, linear, entire; peduncles 1 to 3 at tips of stem and branches, monocephalous, pubescent like the stem, 1 to 2 cm. long; heads about 2 cm. wide; disk 5 to 6 mm. high, 1 to 1.2 cm. thick; involucre about 3-seriate, slightly graduate, 5 to 7 mm. high, the phyllaries linear, acuminate, appressed, subherbaceous with very narrow thin margins, often purplish-tinged, rather sparsely hirsute-pilose especially at base with several-celled loosely ascending hairs, somewhat lacerate-ciliate, glandular-lineate; rays "purplish," when dried white or lavender-tinged, about 76, the lamina linear, 2 or 3-denticulate, 3-nerved, 5 mm. long, 0.6 to 0.8 mm. wide; disk corollas yel-

lowish, glabrous, slender, 4 mm. long (tube 1.5 mm., throat 2 mm., teeth ovate, obtusish, 0.5 mm. long, with a low papillose apical crest); achenes of ray and disk similar, somewhat compressed, 2-nerved, hispid, 1.5 to 1.8 mm. long; pappus bristles about 20, fragile, 1-seriate, 3 to 4 mm. long.

Type in the U. S. National Herbarium, no. 675662, collected on open brushy slopes, Cuesta Grande, eastern slope of Chiriquí Volcano, Panama, altitude 2,600 to 2,990 meters, March 11 to 13, 1911, by William R. Maxon (no. 5306).

ADDITIONAL SPECIMENS EXAMINED:

PANAMA: Chiriquí Volcano, April, 1899, *Sapper*. Sunny places around El Potrero Camp, Chiriquí Volcano, altitude 2,809 to 3,000 meters, March 10 to 13, 1911, *Pittier* 3090.

Near *Erigeron irazuensis* Greenm., of Volcán de Irazú, Costa Rica, in which the apparently procumbent stem is densely hirsute-pilose with longer wide-spreading hairs.

EXPLANATION OF PLATE 56.—*Erigeron maxonii*, from the type specimen. Natural size.

Baccharis alamosana Blake, sp. nov.

Dioecious, shrubby, branched, 40 cm. high and probably much more; stem and branches slender, striate, glabrous, somewhat glutinous; internodes 0.7 to 2.5 cm. long; petioles 2 to 4 mm. long; leaf blades lanceolate, 1.5 to 3 cm. long, 4 to 9 mm. wide, acuminate, acutely cuneate at base, closely and sharply serrulate (the teeth 12 to 22 pairs), papery, glabrous, punctate, obscurely triplinerved; pistillate panicles small, about 2.5 cm. wide, terminating the branches, several to many-headed, glandular-granular, the pedicels 2 to 5 mm. long; involucre about 4-seriate, graduate, 2.5 mm. high, the phyllaries lanceolate (outer) to linear, obtuse, with indurate, narrowly dark-centered body and narrow scarious margins, glandular-granular, toward apex lacerate-ciliate; pistillate heads tiny, 3.2 mm. high, 2.2 mm. thick, 11-flowered, the filiform corollas obliquely truncate, surpassed by the styles; achenes 5-nerved, glabrous, 1.5 mm. long; pappus scanty, whitish, 1-seriate, 2.2 mm. long.

Type in the U. S. National Herbarium, no. 42951, collected in the Sierra de los Álamos, Sonora, Mexico, March 25 to April 8, 1890, by Edward Palmer (no. 291).

A well-defined species, unfortunately represented only by two sheets of over-mature material. The tiny heads and small, lanceolate, closely serrulate leaves characterize the species.

Baccharis occidentalis Blake, sp. nov.

Dioecious; stems numerous from a thick deep root, suffrutescent, slender, juniciform, 0.6 to 1 meter high, striate-angled, rather sparsely erect-branched; lower internodes 1 to 4 cm. long, the upper elongate; leaves linear to linear-oblanceolate, 2 to 5.5 cm. long, 1 to 4.5 mm. wide, acuminate at each end, subsessile, subcoriaceous, entire to remotely sharp-serrulate (teeth sometimes aristiform and 2 mm. long), tripli- or quintuplinerved with prominulous veins or essentially veinless, the upper bracteiform and remote; branches elongate, bearing at tip 3 to 9 loosely cymose-panicled heads, the pistillate on pedicels 1 to 7 cm. long, the staminate on pedicels 3 to 20 mm. long or sometimes glomerate in glomerules of about 3 heads; pedicels glandular-granular; pistillate heads 9 to 10 mm. high, 6 to 10 mm. thick, about 23-flowered; staminate heads 6 mm. high, 5 mm. thick, about 18-flowered; pistillate involucre 4 or 5-seriate, graduate, 5 to 5.5 mm. high, appressed, the phyllaries linear or linear-lanceolate, obtuse to acute, with greenish midline and scarious margins, slightly glandular-granular, ciliate above; staminate involucre similar but about 3-seriate and with acute or acuminate phyllaries, 4.5 mm. high; teeth of the staminate corallas slightly longer than throat, the style branches linear, obtuse, hispidulous, the bristles of pappus dilated toward apex; pistillate achenes 5-striate, somewhat glandular, 3.5 mm. long the rather scanty brownish-tinged pappus about 2-seriate, 8 mm. long.

Type in the U. S. National Herbarium, no. 42952, collected on hillsides near Guadalajara, Jalisco, Mexico, July 19, 1893, by C. G. Pringle (no. 4460).

ADDITIONAL SPECIMENS EXAMINED:

TEPIC: Between Pedro Paulo and San Blascito, foothills of the Sierra Madre, August 4, 1897, *Rose* 1996. Between Dolores and Santa Gertrudis, Sierra Madre, August 7, 1897, *Rose* 2050.

The type collection, distributed as a "large-flowered form" of *Baccharis potosina* A. Gray, includes both sexes. Rose's no. 1996 is pistillate, his no. 2050 staminate. The species differs from *B. potosina* in its less branched, essentially herbaceous stems, longer involucre and considerably larger heads on longer pedicels, and longer pappus. *Baccharis potosina* has been little known since its description. The following specimens, agreeing with the type collection—*Schaffner* 355/779, *Schumann* 100, *Purpus* 4663 and 4482 (4982?), and *Palmer* 413 of 1904—extend its range to Coahuila.

INULEAE.

Achyrocline crassiceps Blake, sp. nov. PLATE 57.

Suffrutescent, 25 to 50 cm. high; stem stout, simple below the inflorescence or with few erect branches, very leafy, densely tomentose-lanate with cinereous or fuscescent hairs, beneath the wool minutely glandular-puberulent; leaves alternate, crowded, elliptic, oblong-elliptic, or obovate-elliptic, 1.5 to 3.5 cm. long, 6 to 12 mm. wide, obtuse or acutish, sessile by a broad rounded or cordate base (concealed beneath the tomentum), not decurrent, densely tomentose-lanate like the stem with cinereous, ochroleucous, or fuscescent wool, beneath the wool densely sordid-pilose with spreading several-celled subglandular hairs, 5-plinerved from base (the veins entirely concealed by the tomentum); heads 5 mm. high, sessile, very numerous in the few dense, ternately arranged, subglobose glomerules terminating stem and branches, these 1.5 to 3.5 cm. thick; involucre 5 mm. high, whitish or rufid-tinged, the phyllaries subequal, about 11, oval-oblong or oblong, obtuse or rounded, or the inner usually apiculate, scarious, nerveless, pilose-lanate toward base; heads 5-flowered, the pistillate flowers 2 or 3, the hermaphrodite 2 or 3; pistillate corollas filiform, 4-denticulate, sparsely short-pubescent at tip, 3 mm. long; hermaphrodite corollas slender-cylindric, 5-denticulate, sparsely pubescent at apex, 3.2 mm. long, achenes ellipsoid, glabrous, 1 mm. long; pappus readily deciduous, the bristle; whitish, 3.5 mm. long.

Type in the U. S. National Herbarium, no. 888688, collected at Bogotá, Colombia, by Brother Ariste Joseph (no. A 17).

ADDITIONAL SPECIMENS EXAMINED:

COLOMBIA: Region of Bogotá, 1919, *Ariste Joseph*. Open rocky mountain slope, altitude 3,000 to 3,100 meters, Chapinero, near Bogotá, September, 1917, *Pennell* 2016. Dry places, foot of the Despeñadero de la Cruz, altitude 2,800 meters, 1918, *Ariste Joseph* A258.

This species is distinct in its densely leafy stem, comparatively large and thickly lanate leaves, and dense glomerules of whitish heads.

EXPLANATION OF PLATE 57.—*Achyrocline crassiceps*, from the type specimen. Natural size.

HELIANTHEAE.

Nocca media Blake, sp. nov.

Suffrutescent, simple below the inflorescence, 90 cm. high and more, the base not seen; stem stoutish, brown, spreading-hirtellous, very sparsely spreading-hirsute near the nodes, glabrescent; leaves opposite, very remote, the internodes 10 to 14.5 cm. long; lowest leaves on broad naked petioles 2.5 mm. long, the others sessile by a narrowed clasping base; blades ovate, 6 to 9 cm. long, 2.5 to 4 cm. wide, acute, rather abruptly narrowed about 1 cm. above the base into a subcordate-clasping

lower portion about 8 mm. wide, serrate with depressed bluntish teeth, firmly pergamentaceous, nearly equally green on both sides, densely and harshly hispidulous on both sides (the hairs of upper surface mostly deciduous except along the veins and with persistent strongly tuberculate bases, those of lower surface persistent and with less conspicuously tuberculate bases), triplinerved about 1.5 cm. above the base, loosely prominulous-reticulate on both sides; inflorescence about 35 cm. long, its branches elongate, erect, densely glandular-hispidulous, pilose toward apex, the bracts small, lance-elliptic, 1.5 to 2 cm. long; glomerules globose-campanulate, subtended by 5 or 6 elliptic bracts 1.3 to 1.8 cm. long; proper involucres 1-flowered, densely silky-villous throughout, the tube 4.5 mm. long, the 5 or 6 teeth very unequal, triangular-subulate or elongated-triangular, acuminate, 1 to 4 mm. long, 1 to 3-nerved; corollas hispid-pilose especially on the teeth, 10 mm. long; achenes (immature) glabrous, 2 mm. long; pappus a lacerate-ciliate crown about 0.3 mm. high, with 1 or 2 subulate pilose-ciliate awns about 0.8 mm. high.

Type in the U. S. National Herbarium, no. 566238, collected between Tixila and Chilpancingo, Guerrero, Mexico, altitude 1,830 to 2,135 meters, December 16, 1894, by E. W. Nelson (no. 2178).

Intermediate between *Nocca pringlei* Robinson and *N. helianthifolia* (H. B. K.) Cass., combining the elongate and comparatively naked inflorescence and the leaf shape of the former with (in the upper leaves) the clasping leaf-bases of the latter. The leaves, however, are green and scabrid on both sides, not densely short-hispid-pilose above and griseous-pilose beneath, as they are in *N. pringlei*.

Nocca pteropoda Blake, sp. nov.

Herbaceous at least above, probably tall; stem glabrescent below, the young branchlets densely spreading-villous and stipitate-glandular; internodes of main stem 13.5 cm. long, those of the branchlets about 1 cm. long; leaves (only those of branchlets seen) opposite, the lower on flattish naked petioles 5 mm. long, the others sessile but not clasping; blades rhomboid-ovate or the lower oval, 4.5 to 10 cm. long, 2.5 to 4 cm. wide, acuminate or sometimes obtuse, cuneate at base, sharply serrate above the entire lower portion or subentire, subpergamentaceous, above densely and harshly hispidulous with mostly deciduous hairs with persistent tuberculate bases, beneath slightly paler green, rather densely, finely, and softly spreading-pilosulous and sparsely pilose, and along the veins stipitate-glandular, triplinerved 1 to 2 cm. above the base, at maturity prominulous-reticulate beneath; inflorescence trichotomously divided, short and dense, about 23 cm. wide, the bracts ovate, strongly reticulate, 3 to 4.5 cm. long; glomerules campanulate, subtended by foliaceous bracts; proper involucres 1-flowered, silky-villous especially below the apex, the tube 6 mm. long, the usually 6 teeth very unequal, 1 to 2.5 mm. long, the 1 or 2 largest oblong, acuminate, the others quadrate to broadly triangular, obtuse or apiculate to short-acuminate; corollas hispidulous, 1.3 cm. long (tube 3.5 mm., throat 7 mm., teeth oval-ovate, obtuse, 2.5 mm.); achenes (submature) glabrous except at the hispidulous apex, 4.5 mm. long; pappus a fimbriate crown 0.7 mm. long, of chiefly united, blunt squamellae, the 2 on the angles narrower and acute but scarcely longer than the others.

Type in the U. S. National Herbarium, no. 1,038,731, collected at Cuyamecala, District of Cuicatlán, Oaxaca, Mexico, April 14, 1919, by C. Conzatti and I. C. Gómez (no. 3470).

Nearest *Nocca helianthifolia* (H. B. K.) Cass., with which it agrees in its trichotomous flattish inflorescence, but lacking the clasping leaf bases of that species.

Clibadium propinquum Blake, nom. nov.

Wulffia sodiroi Hieron. Bot. Jahrb. Engler **29**: 34. 1900. Not *Clibadium sodiroi* Hieron. 1900.

Fragments of the type, supplied by the Berlin Herbarium, show that this species is a *Clibadium* near *C. eggersii* Hieron., from which it differs in its smaller heads and

fewer pistillate flowers. Hieronymus gives the number of pistillate flowers as 16, and the hermaphrodite 4; but in a head from the type dissected by the writer the pistillate flowers were 29, and the hermaphrodite 9.

Clibadium pentaneuron Blake, sp. nov.

Presumably frutescent; stem stout, fuscous, subterete, evenly strigose and strigillose with tightly appressed hairs; leaves opposite, or alternate toward the inflorescence; petioles 10 to 16 mm. long, strigose and strigillose; blades oval-ovate, 8 to to 14 cm. long, 3.5 to 7.5 cm. wide, acuminate, at base cuneate or rounded-cuneate, thick-pergamentaceous, serrate with 12 to 20 pairs of subremote salient teeth about 1 mm. high, deep green on both sides, above sparsely and harshly strigose (the hairs with lepidote-tuberculate bases), in age smoothish, beneath evenly but sparsely strigillose with subtuberculate-based hairs, quintuplinerved within 2 cm. of the base, the primary and secondary veins prominulous above, the tertiary impressed, all the veins and veinlets prominent-reticulate beneath; leaves subtending the inflorescence smaller, elliptic-ovate or lance-ovate, 7 to 9 cm. long, 2.5 to 3 cm. wide; panicles terminating stem and branches, concave, about 9 cm. wide, tiny-bracted, the heads irregularly approximate toward the tips of the branches; heads sessile, subglobose to obovoid-subglobose, 4 to 5 mm. high, 3.5 to 4 mm. thick; phyllaries 3, suborbicular to suborbicular-ovate, 3.5 to 4 mm. long, 2.8 to 3.2 mm. wide, obtuse or acutish, greenish white, at maturity erubescent, strigillose chiefly above and short-ciliate, about 5-nerved; pistillate flowers 5 or 6, the hermaphrodite 7 or 8, all paleate; outer pistillate pales similar to the phyllaries, the inner oblong-oval, acute, 4 mm. long, 2.2 mm. wide, the hermaphrodite pales oblong or obovate-oblong, scarious, 2.5 mm. long, 1.2 to 2 mm. wide, truncate or rounded, lacerate-ciliate above; pistillate corollas reddish purple, glabrous, 3-toothed, 1.8 mm. long, the ovaries densely pilose above, obovate, 2.4 mm. long, 1.5 mm. wide, the mature achenes not seen; hermaphrodite corollas reddish purple, hispidulous above, 2.8 mm. long, the tube 0.7 mm. long, the sterile ovaries turbinate, densely pilose at apex, sparsely so below, 1.4 mm. long.

Type in the Gray Herbarium, collected presumably in Colombia by C. F. Lehmann, and distributed under the Bentham Trustees No. 1256. Photograph and fragments in the National Herbarium. Duplicates in the herbarium of the New York Botanical Garden (labeled B. T. 855 and B. T. 1256).

This species is a member of the section *Trixidium*, characterized by having all the flowers of the head subtended by pales, and is related to *C. terebinthaceum* (Swartz) DC. In that species the leaves are membranaceous, merely serrulate, with the hairs of the under surface somewhat spreading, the phyllaries are acute or subacuminate, and the pistillate corollas are pubescent on the teeth.

Clibadium parviceps Blake, sp. nov.

Shrub; branches slender, striatulate or striate, evenly but not densely strigose and strigillose, glabrescent; leaves opposite throughout; petioles slender, strigose and strigillose, 1.3 to 2.7 cm. long; blades ovate, 8 to 11.5 cm. long, 2.8 to 5.5 cm. wide, acuminate, at base acute or acuminate, serrulate (teeth 10 to 20 pairs, very small, acute, callous-tipped), membranaceous, above deep green, evenly but not densely scaberulous-strigillose, the hairs more or less deciduous in age leaving the lepidote bases, beneath scarcely paler green, similarly pubescent, 3-plinerved or somewhat 5-plinerved above the base, the chief veins prominulous beneath; panicles terminal, trichotomous, many-headed, 4.5 to 8 cm. wide, the axis and branches densely strigose or hispid-strigose with appressed or ascending hairs, the heads irregularly clustered, not glomerate, sessile or subsessile; heads obovoid or in fruit subglobose-obovoid, 3 mm. thick, in flower 8 mm. high (including the exserted stamens), in fruit 3.5 mm.; phyllaries 3, suborbicular-ovate, 3.2 to 3.7 mm. long, 2.5 to 2.8 mm. wide, acute to obtusish, 5 to 9-nerved, greenish, strigillose above and short-ciliate; pistillate flowers 5, all paleate, the hermaphrodite 5, all but the 1 or 2 innermost paleate; pistillate pales

similar to the phyllaries, acutish to obtuse, the innermost smaller; hermaphrodite pales oblong, obtuse, ciliate, 2 mm. long; pistillate corollas white, tridenticulate, minutely hispidulous above, 2.2 to 2.6 mm. long, the ovaries densely pubescent toward apex, the achenes obovate or suborbicular-obovate, similarly pubescent, 2 mm. long, 1.2 mm. wide; hermaphrodite corollas white, obovoid-campanulate, hispidulous above, 5-denticulate, 3.8 mm. long (tube 0.8 mm., limb 2.5 mm., with 10 glandular-vittate veins, teeth deltoid, 0.5 mm.), the ovaries pilose except toward base, 1.8 mm. long.

Type in the Gray Herbarium, collected at Colonia Tovar or vicinity, Venezuela, 1856–57, by A. Fendler (no. 1967). Photograph and fragments in the U. S. National Herbarium.

This species is closely related to *C. acuminatum* Benth., of which I have examined a good specimen (*Stewart* 326) in the Gray Herbarium from the type locality, Cocos Island, about 300 miles off the western coast of Costa Rica. In that species the phyllaries in several heads dissected are always 2, narrower than in *C. parviceps* (ovate or broadly ovate) and acute or subacuminate, the 3 to 5 hermaphodite flowers are all paleate, or only the central one is epaleate, the heads are slightly smaller, the pistillate corollas are stipitate-glandular and only 1.8 mm. long, and the hermaphrodite corollas are only 2.5 mm. long. In other features the two species are very similar.

Clibadium grandifolium Blake, sp. nov.

Habit unknown; upper part of stem stout, herbaceous, 4 to 6 mm. thick, strigose and strigillose; leaves opposite; petioles of the leaves just below the inflorescence 5 to 11 cm. long, sulcate above, narrowly wing-margined throughout, the wing 1 mm. wide or less; blades of the leaves just below the inflorescence broadly ovate or rotund-ovate, 15 to 28 cm. long, 12 to 23 cm. wide, short-pointed, truncate-rounded at base and then short-cuneate into the petiole, serrulate (teeth 40 to 80 pairs, depressed, mucronulate, 0.5 to 1.5 mm. high), papery, above deep green, scabrid with minute erectish hairs with lepidote-tuberculate bases and sparsely hispidulous-strigillose, beneath nearly equally green and evenly strigillose, triplinerved above the base, the veins and veinlets slightly prominulous on both sides; leaves subtending the lowest branches of the inflorescent ovate, 10 to 15 cm. long, 7.5 cm. wide, acuminate, at base cuneate, irregularly serrate and serrulate, on petioles about 3 cm. long; panicle terminal, 17 to 24 cm. wide, ternately divided, with innumerable heads; heads irregularly approximate, sessile, oval-oblong to subglobose, 4.8 to 6.5 mm. high, 3 to 4.5 mm. thick; phyllaries 2 or 3, ovate to deltoid-ovate or broadly oval-ovate, 3.2 to 4.5 mm. long, 2.5 to 3.5 mm. wide, acute or the outermost acuminate, whitish, 3 to 9-nerved, strigillose especially near apex and short-ciliate; pistillate flowers 8 to 11, all paleate, the hermaphrodite 9 or 10, 2 to 8 of them paleate; outer pistillate pales suborbicular-ovate to oblong-ovate, acute, the inner oblong, acute to acuminate, lacerate-ciliate, 4.5 mm. long, 2 mm. wide; hermaphrodite pales ovate-oblong or oblong, lacerate-ciliate, 2 mm. long; pistillate corollas white, glabrous, 3-denticulate, 2.3 mm. long, the ovaries densely pilose above, the achenes obovate-suborbicular, pilose above, 2.2 mm. long, 1.8 mm. wide; hermaphrodite corollas white, hispidulous above, 3.8 to 4 mm. long (tube 0.6 to 1 mm., throat 2.8 mm., teeth 0.4 mm.), the sterile ovaries densely pilose throughout, 1 to 2.2 mm. long.

Type in the U. S. National Herbarium, no. 355188, collected along the Río Pacuare, Llanuras de Santa Clara, Costa Rica, altitude 150 meters, April, 1896, by J. D. Smith (no. 6614).

ADDITIONAL SPECIMEN EXAMINED:

COSTA RICA: Along the Río Zent, altitude 100 meters, January, 1900, *Pittier* 16068 (Gray Herbarium).

The closest relationships of this species appear to be with *C. caudatum* and *C. appressipilum* Blake, from both of which it differs in the character of its leaves and in the fact that several or most of its hermaphrodite flowers are provided with pales, as

well as in its acute phyllaries. Both of the specimens were originally determined as *C. erosum* (Swartz) DC., a West Indian species of the section *Trixidium*.

Clibadium caudatum Blake, sp. nov.

Evidently frutescent, about 3 meters high; stem stout, subterete, striate-costate above, densely griseous-strigose with closely appressed hairs; leaves opposite; petioles densely strigose, 1 to 2 cm. long; blades of the stem leaves ovate, 17.5 cm. long, 8.5 cm. wide, caudate-attenuate, at base abruptly short-cuneate into the petiole, thick-papery, coarsely serrate with about 28 pairs of unequal triangular mucronulate teeth about 3 mm. high, above dark green, harshly strigillose with lepidote-based hairs and along the ribs hispid-strigose, beneath paler green, evenly short-strigose on veins and surface, triplinerved about 1 cm. above the base, the veins and veinlets impressed above, prominulous-reticulate beneath; panicles terminating stem and branches, about 10 cm. wide, irregularly ternate-divided, many-headed, their branches very densely hispidulous-pilosulous with sordid spreading hairs; heads irregularly approximate toward tips of branches of inflorescence, on pedicels 1 mm. long or sessile, subglobose or oblong-oval, 5 to 6 mm. high, 4 to 4.5 mm. thick; phyllaries 3, suborbicular or suborbicular-ovate, 4 to 4.5 mm. long, 3.5 to 4.5 mm. wide, obtuse, whitish, viridescent below, 12 to 16-nerved, evenly strigillose and ciliate; pistillate flowers 9 to 11, paleate, the hermaphrodite 11 or 12, epaleate; outer pistillate pales similar to the phyllaries but only 7 to 11-nerved, the inner obovate-oblong, 3 or 4-nerved, 4.5 mm. long; pistillate corollas white, 3-toothed, hispidulous at apex, 2 mm. long, the achenes blackish olive, oval-obovate, 2.5 mm. long, 1.8 mm. wide, pilose toward apex; hermaphrodite corollas white, hispidulous at apex, 3.2 mm. long (the obscure tube 0.4 mm. long), the ovaries densely villous except at base, 1.2 to 2.4 mm. long.

Type in the U.S. National Herbarium, no. 675137, collected in alluvial bottom near Bohío, Canal Zone, Panama, altitude 10 to 20 meters, February 12, 1911, by William R. Maxon (no. 4767).

This species is related to *Clibadium arboreum* Donn. Smith and *C. surinamense* L., both of which have only 3 to 6 female florets, while the present species has 9 to 11. In both these species the pubescence of the stem is spreading or curved-ascending, not tightly appressed as in *C. caudatum*.

Clibadium appressipilum Blake, sp. nov.

Suffruticose, 2 to 3 meters high, the stem up to 2.5 cm. thick below; stem (above) stoutish, subterete, densely and cinereously strigose and strigillose with closely appressed hairs; leaves opposite; petioles slender, densely strigose and strigillose, 1 to 4 cm. long; blades broadly ovate, 8.5 to 15.5 cm. long, 4 to 9.5 cm. wide, acuminate or caudate-acuminate, at base cuneate to broadly rounded, serrulate with about 16 pairs of depressed mucronulate teeth, papyraceous, above dull green, strigillose or strigose and strigillose with tuberculate-based hairs, beneath paler green, evenly strigillose on veins and surface, triplinerved 1 to 2 cm. above the base, the veins and veinlets impressed above, more or less prominulous beneath; panicles terminating stem and branches, convex, about 5 cm. wide, many-headed, hispid-strigose with appressed or closely ascending hairs, ternately divided: heads approximate, subsessile, subglobose, 4.5 to 5 mm. high, 4 to 5 mm. wide; phyllaries 3, orbicular to oval-orbicular, 3 to 3.3 mm. long, 2.4 to 3 mm. wide, greenish white, very obtuse, 9 to 11-nerved, rather densely short-strigose and short-ciliate; pistillate flowers 8 or 9, all paleate, the hermaphrodite 10 to 15, only one or none paleate; outer pistillate pales similar to the phyllaries, the inner oblong-obovate, acutish, 3.8 mm. long, 5 to 7-nerved; hermaphrodite pale similar to the inner pistillate; pistillate corollas white, 3-denticulate, hispidulous above, 1.8 to 2 mm. long, the ovaries sparsely or rather densely hairy at apex, the achenes blackish, oval-obovate, 2 to 2.2 mm. long, 1.8 to 2 mm. wide, at apex pilose to very sparsely puberulous or

essentially glabrous; hermaphrodite corollas white, 3.2 to 3.8 mm. long, hispidulous above, the outer with distinct tube 0.8 mm. long and funnelform throat, the sterile ovaries densely villous especially above, 1.2 to 2 mm. long.

Type in the U. S. National Herbarium, no. 678224, collected at Boca de Cupe, Panama, April 13, 1908, by R. S. Williams (no. 698). Duplicate in herbarium of the New York Botanical Garden.

ADDITIONAL SPECIMENS EXAMINED:

PANAMA: Banks of Mamoni River, above Chepo, Province of Panama, altitude 20 meters, October, 1911, *Pittier* 4730. Along the Río Culebra, above Santa Isabel, Province of Colón, near sea level, August 10, 1911, *Pittier* 4157.

The nearest ally of this species is *C. caudatum*, described above, in which the leaves are coarsely serrate, the branches of the inflorescence densely hispidulous-pilosulous with spreading hairs, and the phyllaries 12 to 16-nerved.

Clibadium grande Blake, sp. nov.

Stem not seen; petiole stout, channeled above, glabrescent, 21 cm. long; leaf blade broadly ovate, about 31 cm. long, 30 cm. wide, acute, at base broadly rounded, unequally dentate-serrate (teeth about 70 pairs, depressed-deltoid, apiculate, about 3 mm. high), papery, above dull green, minutely scabrid-strigillose, beneath green, evenly but not densely strigillose over whole surface, along the veins strigillose or strigose and more densely sordid-tomentulous, triplinerved and with 2 pairs of weaker veins below the main nerves, the chief veins prominent beneath, the smaller ones prominulous; peduncle 14.5 cm. long and more, strigose and sordid-tomentulose with matted hairs; panicle similarly pubescent, about 9 cm. long, 11 cm. wide, many-headed, the heads sessile, irregularly approximate, not glomerate; heads in flower oblong-cylindric, 5.5 mm. high, 2.5 mm. thick, in fruit subglobose, 3 to 3.5 mm. high and thick; phyllaries 3, broadly ovate (outermost) to suborbicular-ovate, 3.5 to 3.8 mm. long, 2.6 to 3 mm. wide, acute or the outermost subacuminate, strigillose chiefly above and short-ciliate, 5 to 8-nerved; pistillate flowers 6, all paleate, the hermaphrodite 8 or 9, naked or only one paleate; pistillate pales similar to the phyllaries but smaller; hermaphrodite pale ovate-oblong, 2 mm. long or less, lacerate-ciliate, acute; pistillate corollas white, 2 or 3-denticulate, glabrous, 2.1 mm. long, the ovaries densely pilose above, the achenes suborbicular, pilose at apex, with short abrupt stipelike base, 2 mm. long, 1.8 mm. wide; hermaphrodite corollas white, hispidulous at apex, 3.3 mm. long (tube 0.8 mm., throat 2.2 mm., teeth 0.3 mm.), the sterile ovaries densely hispid-pilose throughout, 1.2 mm. long.

Type in the Gray Herbarium, collected at La Florida, along the Atlantic Railway, Costa Rica, altitude 80 meters, June 18, 1897, by H. Pittier (no. 11280). Photograph and fragments in U. S. National Herbarium.

Although the material examined consists only of an inflorescence and a detached leaf, probably from the lower part of the stem, it is sufficient to show that it represents a new species. *Clibadium grande* resembles *C. grandifolium* Blake in its large long-petioled leaves, but is readily distinguished by its fewer flowers, somewhat different pubescence, smaller heads, and nearly or quite naked disk. From *C. arboreum* Donn. Smith and *C. pueblanum* Blake it is distinguished by the lack of long spreading pubescence on the stem and inflorescence.

Clibadium pueblanum Blake, sp. nov.

Upper portion of stem herbaceous, stout, 6 mm. thick, subterete, striatulate, densely strigillose with persistent hairs, and hispid-pilose with several-celled, spreading, at length deciduous hairs; leaves opposite, or the uppermost alternate; petioles 1.5 to 4.5 cm. long, slender, densely strigillose and hispid-pilose; blades ovate to broadly ovate, 10.5 to 14.5 cm. long, 5.5 to 11.5 cm. wide, acuminate, cuneate at base, serrulate above the subentire base with about 20 pairs of mucronulate teeth, papery, above dull green, very harshly tuberculate-hispidulous and sparsely hispid-pilose with

decidous hairs, especially along the veins, beneath slightly paler green, densely hispidulous and hispid with spreading curved hairs (these longer along the veins), triplinerved and prominulous-reticulate beneath; panicles terminating stem and branches, 7 to 16 cm. wide, very many-headed, densely pubescent like the stem; heads rather closely aggregate, sessile, subglobose, 3 to 4 mm. high, 2.5 to 3.5 mm. in diameter; phyllaries 3 to 4, suborbicular-ovate to suborbicular, 2.5 to 3.5 mm. long, 2.2 to 3.5 mm. wide, abruptly acutish, whitish, ciliate, sparsely short-strigose toward apex or essentially glabrous, 4 to 8-nerved; pistillate flowers 6 or 7, paleate, the hermaphrodite 7 or 8, epaleate; pales of the pistillate flowers similar to the phyllaries, the inmost oblong-ovate, acute, 3.8 mm. long; pistillate corollas white, 4-toothed, hispidulous at apex, 2.2 mm. long, the achenes broadly obovoid, densely pilose at apex, 1.8 to 2 mm. long, 1.5 to 1.7 mm. wide; hermaphrodite corollas white, hispidulous above, 3.2 to 3.5 mm. long, the tube 0.5 mm. long, the sterile ovaries linear, densely pilose chiefly above the middle, at maturity 2.5 mm. long.

Type in the U. S. National Herbarium, no. 1,038,790, collected at Pahuatlán, District of Huauchinango, Puebla, Mexico, October 4, 1914, by F. Salazar.

This species finds its nearest relative in *Clibadium arboreum* Donn. Smith, which has larger heads (5 to 6 mm. long), phyllaries densely strigillose at least above, and achenes 2.8 to 3 mm. long.

Clibadium schulzii Blake, sp. nov.

Oppositely branched shrub; stem striate-angulate, densely pilose-tomentose with dull ascending hairs, glabrescent, the young branchlets slender, 6-angulate, densely pilose-tomentose with yellowish white spreading-ascending hairs, glabrescent; leaves opposite; petioles 3 to 11 mm. long, densely pubescent like the young branchlets; blades lance-ovate, 6 to 9.5 cm. long, 2.2 to 3.2 cm. wide, acuminate, at base acutely cuneate, papyraceous, serrulate with about 17 pairs of depressed mucronulate teeth, triplinerved about 1 cm. above the base, above evenly but not densely strigose with persistent hairs, in age smooth to the touch, beneath much paler, in youth densely fuscescent-pilose with subappressed hairs, at maturity densely and rather softly griseous-pilose with ascending hairs, the veins and veinlets somewhat impressed above, prominulous-reticulate beneath; peduncles terminating stem and branches, 1 to 4 cm. long, pubescent like the stem, once or twice 3-forked, the panicles 3 to 6 cm. wide, rather dense, about 50-headed; heads approximate, on pedicels 2 mm. long or less, subglobose, 3.5 to 4 mm. high and thick; phyllaries 3, suborbicular-oval to broadly ovate, 3.8 to 4.4 mm. long, 2.8 to 3.2 mm. wide, obtuse to acutish, with callous apex, at maturity coriaceous-herbaceous (especially the outermost) and blackish green, ciliate, essentially glabrous dorsally, obscurely 8 or 9-nerved; pistillate flowers 5 or 6-paleate, the hermaphrodite 12 to 14, epaleate; pales of the pistillate flowers similar to the phyllaries but less coriaceous, the innermost subscarious, acute, lacerate-ciliate; pistillate corollas glabrous, whitish, 3-toothed, 2.4 mm. long, the achenes obovoid with slender base, 2.5 mm. long, 1.8 mm. wide, blackish-olive, sparsely pilose at apex; hermaphrodite corollas not seen, the sterile ovaries densely villous above the middle, linear, 3.5 mm. long.

Type in the U. S. National Herbarium, no. 577501, collected in thickets at Copey, Costa Rica, altitude 1,800 meters, March, 1898, by A. Tonduz (no. 11915).

In his revision of *Clibadium*, O. E. Schulz referred [5] the type number of this species to *Clibadium anceps* Greenm., the type number of which he had evidently not examined. His description of *C. anceps* is entirely that of the plant here named *C. schulzii*, although his key characters are taken from Greenman's description. Because of its small heads, coriaceous-herbaceous phyllaries, and ultimately smooth leaves, the true relationship of *C. schulzii* is evidently with *C. sylvestre* (Aubl.) Baill. (*C. vargasii* DC. of Schulz's revision [6]), which has griseous-strigose branches, much broader ovate

[5] Bot. Jahrb. Engler **46**: 621. 1912.

[6] See Blake, Contr. Gray Herb. n. ser. **52**: 4. 1917.

leaves, strigillose or strigose beneath, and rather densely strigillose phyllaries. *C. schulzii* is very similar in appearance and pubescence to *C. leiocarpum* Steetz, of which there are good specimens in the National Herbarium collected by Pittier (no. 3136) on Chiriquí Volcano, the type locality; but in that species the fertile ovaries are glabrous or merely papillose at apex even in the flowering stage, the pistillate corollas are hardly 2 mm. long, the sterile ovaries at maturity only 2.4 mm. long or less, and the achenes suborbicular-obovoid, without the distinct stipe-like base of *C. schulzii*. As the phyllaries and outer pales in *C. leiocarpum* are whitish and thin in flower, but in fruit coriaceous-herbaceous, it is probable that a similar variation will be found in *C. schulzii* when its flowering stage becomes known. Owing to Schulz's misinterpretation of *C. anceps* Greenm., he has placed the latter species in a wrong position in his key. It belongs in the group of *C. leiocarpum* and *C. micranthum*, with glabrous ovaries, and may readily be distinguished by its oblong heads 5 to 6 mm. high, collected in groups of about 6 into glomerules 10 to 12 mm. in diameter.

Clibadium sychnocephalum Blake, sp. nov.

Presumably shrubby; upper part of stem terete, rather sparsely strigose, soon glabrate, slightly pustulate from the subpersistent bases of the hairs; leaves opposite, or subopposite above; petioles slender, 1 to 2.5 cm. long, hispid above with tuberculate-based hairs; blades ovate, 9 to 12.5 cm. long, 3.2 to 5.5 cm. wide, slenderly acuminate, at base acutely cuneate, thin, sharply serrate or serrulate above the base with 9 to 15 pairs of lanceolate or deltoid usually falcate-acuminate teeth 2.5 mm. long or less, triplinerved about 1 cm. above the base, bright green and somewhat shining above, evenly but sparsely tuberculate-hispidulous with incurved hairs, along the chief nerves hispidulous and hispid-pilose, soon glabrate and smoothish on surface, beneath nearly equally green, in youth densely and subsericeously pubescent, at maturity evenly but sparsely hispid-pilose with ascending hairs, the secondary and tertiary veinlets mostly impressed above, prominulous beneath; peduncles one or two at tips of branches, 4 cm. long or less, densely hispid-pilose with dull several-celled spreading hairs, bearing about 3 glomerules; bracts about 8 mm. long; glomerules very dense, 10 to 12 mm. thick, subglobose, subsessile or on partial peduncles 14 mm. long or less; heads sessile, subglobose, 4.5 to 5.5 mm. high, 5 to 6 mm. in diameter; phyllaries 4 or 5, ovate, 5.5 mm. long, 3 mm. wide, hispid-strigose especially above the base and ciliate, with indurate base and shorter, distinctly herbaceous (in age erubescent), acute to acuminate, reflexed apex; pistillate flowers 10 to 12, paleate, the hermaphrodite 10 or 11, only the outermost paleate; pales subtending the pistillate flowers similar to the phyllaries, the inner with erect tips; hermaphrodite pales oblong, obtuse, sparsely ciliate, 3 mm. long; pistillate corollas white, 3-toothed, glabrous, 2.8 mm. long, the achenes (not mature) suborbicular-oval, pubescent at apex, 2 mm. long; hermaphrodite corollas white, hispid at apex, 4 mm. long, the sterile ovaries oblong or linear-oblong, bearing a very few hairs at apex, 1.2 to 2 mm. long.

Type in the U. S. National Herbarium, no. 531405, collected in clearings near Río Flautas, in the Río Paez Valley, Tierra Adentro, Cauca, Colombia, altitude 2,900 meters, January 26, 1906, by H. Pittier (no. 1211).

This very distinct species may be distinguished from its nearest ally, *Clibadium trianae* (Hieron.) Blake, by its larger heads, squarrose phyllaries and pistillate pales, more numerous flowers, and much larger corollas.

Espeletia argentea phaneractis Blake, subsp. nov.

Characters of *E. argentea;* heads radiate, the rays "yellow," numerous, about 3-seriate, the tube 1 to 1.3 mm. long, densely spreading-pubescent with short several-celled hairs, the lower of these with a narrower elongate terminal cell, the lamina oblong, 3.5 to 4.5 mm. long, 1.5 mm. wide, unevenly tridenticulate; disk corollas 4.5 mm. long, the tube and base of throat with a few hairs like those of the rays, the

teeth sparsely stipitate-glandular on back and sometimes with a few longer several-celled hairs.

Type in the U. S. National Herbarium, no. 1042324, collected on a dry páramo on a mountain west of Zipaquira, Department of Cundinamarca, Colombia, altitude 3,100 to 3,200 meters, October 20 to 24, 1917, by F. W. Pennell (no. 2522).

ADDITIONAL SPECIMEN EXAMINED:

COLOMBIA: Andabaleos and Santa Rosa, Department of Cundinamarca, altitude 3,200 to 4,000 meters, January 13, 1883, *Lehmann* 2405 (sketch and fragm., Gray Herb.).

This plant differs from typical *Espeletia argentea* H. B. K., to which I refer Pennell's no. 2687 from Río San Cristóbal, near Bogotá, in the characters above enumerated, but agrees in pubescence and apparently all other features. In *E. argentea*, as exemplified by *Pennell* 2687, the heads are disciform, with the 4 or 5-seriate pistillate flowers provided with tubular, irregularly 3-toothed, densely hispid-pilose corollas 1.3 to 2.3 mm. long, and the teeth of the disk corollas are densely long-hirsute dorsally.

Polymnia apus Blake, sp. nov.

Herbaceous above, probably tall, the lower portion not seen; stem rather stout, striate and 4-sulcate, rather densely spreading-pilose with loose crisped many-celled hairs about 1.5 mm. long, and stipitate-glandular especially above; internodes 6 to 16 cm. long; leaves opposite, sessile, broadly rhombic or rhombic-suborbicular, 13.5 to 25.5 cm. long, 8.5 to 25 cm. wide, acute or short-acuminate, abruptly contracted about 1 cm. above the base into cordate-clasping connate bases 2.2 cm. wide or more, repand-dentate and denticulate nearly to base (teeth low, bluntly callous-tipped, 3 to 10 mm. apart), submembranaceous, above deep green, evenly but not densely short-pilose on surface with many-celled loose sordid hairs with subglandular bases, densely so along the veins, beneath densely griseous-pilosulous with loose hairs, triplinerved 2 to 6 cm. above the base and loosely reticulate; uppermost pair of leaves, much smaller, ovate, 9 cm. long, 3 cm. wide; peduncles ternate at apex of stem and solitary in the upper axils, 1 or (abnormally) 2-headed, densely stipitate-glandular, 6 to 8 cm. long, naked or with a pair of small bracts; heads about 4 cm. wide; disk about 1.3 cm. high, 1.8 cm. thick; involucre 2-seriate, the outer phyllaries 5, lance-ovate, bluntly callous-tipped, 1.7 to 2.5 cm. long, 5 to 9 mm. wide, herbaceous, loosely spreading, with somewhat reflexed margins, densely stipitate-glandular and somewhat sordid-pilose, the inner (subtending the rays) 10, ovate-lanceolate, acuminate, with inflexed margins, 11 mm. long, stipitate-glandular and especially below and on margin pilose with many-celled hairs; rays 10, yellow, fertile, the lamina oblong, tridentate (the central tooth largest), about 17 mm. long, 5 mm. wide; disk flowers sterile, their corollas yellow, sparsely pilose especially toward apex of tube and on teeth, 8.5 mm. long (tube 4 mm., throat 3 mm., teeth 1.5 mm.); pales lance-ovate 7 mm. long, acuminate, spreading at apex, stipitate-glandular especially toward apex and on margin; ray achenes (immature) plump, glabrous, apparently obcompressed, 5 mm. long, 3 mm. wide.

Type in the U. S. National Herbarium, no. 300979, collected in the Sierra Madre between Santa Gertrudis and Santa Teresa, Tepic, Mexico, August 8, 1897, by J. N. Rose (no. 2079).

The type specimen was originally identified as *Polymnia edulis* Wedd. From that South American species it differs in its considerably longer and narrower outer phyllaries, longer rays, and various other characters.

Polymnia parviceps Blake, sp. nov.

Herbaceous above, probably shrubby below, the lower portion not seen; stem glabrous or very sparsely hirsute below the inflorescence, striate, apparently somewhat glutinous, the internodes 3.5 to 5.5 cm. long; leaves opposite; petioles 2.5 to 8 cm.

long, broadly winged, 3 to 15 mm. wide, at base ampliate and connate-clasping; blades ovate, 10 to 17 cm. long, 4 to 11 cm. wide, acuminate, cuneately contracted into the winged petiole, unequally repand-dentate (teeth deltoid, acutish to obtuse, 1 to 5 mm. high, 5 to 7 mm. apart), papery, above deep green, sordid-puberulous along the chief veins, essentially glabrous on surface, smooth to the touch, somewhat bullate, beneath paler green, evenly but not densely pilosulous along the veins and veinlets, triplinerved above base of blade, loosely prominulous-reticulate beneath; panicle terminal, ternately divided, very many-headed, flattish, 18.5 cm. wide, rather densely sordid-puberulous with crisped eglandular hairs, the bracts linear or linear-subulate, 3 to 10 mm. long, the pedicels 5 to 15 mm. long, nodding; mature heads about 8 mm. wide; disk in fruit 3.5 to 4.5 mm. high, 4.5 to 6 mm. thick; involucre 2-seriate, the outer phyllaries 5, lance-ovate or ovate, 4 to 4.5 mm. long, 1 to 1.8 mm. wide, acutish, herbaceous, sparsely stipitate-glandular on margin and back, the inner (subtending the rays) 10, broadly ovate, submembranous, obtuse, sparsely glandular, 3 mm. long; rays 10, yellow, fertile, the lamina oval-oblong, bidentate, 3.8 mm. long, 1.8 mm. wide; disk flowers sterile, their corollas yellow, glabrous, 2.8 mm. long (tube 1.1 mm. long, abruptly widened into the campanulate throat, this 1.1 mm. long, teeth 0.6 mm. long); pales oblong-ovate, 2.8 mm. long, acute, irregularly dentate, sparsely stipitate-glandular on margin; ray achenes broadly obovoid, plump, somewhat compressed. blackish, glabrous, epappose, 2.5 mm. long, 2 mm. wide.

Type in the U. S. National Herbarium, no. 603981, collected at Torontoy, in the Urubamba Valley, Peru, altitude about 2,400 meters, May 20, 1915, by O. F. Cook and G. B. Gilbert (no. 818).

The native name of *P. parviceps* is given as "yarita." The species is nearest *P. microcephala* Hieron., of Ecuador. In that plant, fragments from the type of which (*Sodiro* 24/2) are now in the National Herbarium, the leaves are subscabrous above, and the tube of the disk corollas passes gradually into the nearly funnelform throat.

Guardiola tulocarpus pubescens Blake, subsp. nov.

Stem (especially at the nodes), inflorescence, and petioles loosely and rather densely pubescent with several-celled sordid hairs; leaves at first densely sordid-pubescent beneath, at maturity rather densely pilosulous on the veins on both sides, sparsely so on surface.

Type in the U. S. National Herbarium, no. 1,083,852, collected in the Arroyo del Espinal, San Ignacio, Sinaloa, Mexico, altitude 300 meters, by J. G. Ortega (no. 4593).

The typical form of *Guardiola tulocarpus* A. Gray is glabrous throughout. I have seen a single specimen, collected by E. W. Nelson (no. 4084) near San Sebastián, Jalisco, which approaches this new form in having a similar but less dense pubescence (in this case subglandular) on the stem and the branches of the inflorescence, but the leaves are glabrous as in the typical form of the species. The local name of the new subspecies is given as "vara prieta."

Melampodium cinerascens Blake, sp. nov.

Herbaceous perennial, or suffrutescent below, several-stemmed, erect, about 23 cm. high; stems slender, trichotomously branched, densely and cinereously tuberculate-hispidulous with antrorse hairs with subglandular bases; internodes 1.3 to 3 cm. long; leaves opposite, linear or elliptic-linear, 1 to 2 cm. long, 1 to 3 mm. wide, obtuse, sessile, entire, revolute-margined, firm, above dull green, pubescent like the stem, beneath paler green, similarly pubescent with somewhat looser hairs and densely gland-dotted; peduncles terminating stems and branches, monocephalous, 1 to 2.8 cm. long, pubescent like the stem, very slender; heads in fruit 6 to 7 mm. wide; disk 3.5 to 5 mm. high; involucre 2-seriate, the outer phyllaries 5, broadly ovate or suborbicular-ovate, at maturity 4 mm. long, 2 to 3 mm. wide, connate for one-third to one-half their length, obtuse, subherbaceous without scarious margin, 3-nerved, densely antrorse-hirsute and ciliate with tuberculate-based hairs; rays about 7, white, the

lamina suborbicular, bidentate, 3 mm. long, 2.5 mm. wide; disk corollas white, densely hispidulous on tube, sessile-glandular on teeth outside, densely barbate-tufted at apex of teeth inside, 2.5 mm. long (tube 0.7 mm., throat 1.2 mm., teeth 0.6 mm.); pales (in natural position) with narrowly cuneate eciliate base and abruptly dilated, deltoid, obtuse, yellowish, lacerate, sessile-glandular apex, ciliate on costa, 3 mm. long; fruit (ray achenes with their enveloping phyllaries) 3.5 to 3.8 mm. long, the body curved-obovoid, 1.5 to 1.8 mm. high, 1.2 mm. wide, somewhat compressed, about 3-ribbed on the sides, not reticulate, rather densely muricate with short thick blunt subglandular papillae, the thick, whitish, somewhat nervose, sparsely hirsute and glandular hood 1 mm. high, abruptly terminated by a subulate, acuminate, sparsely hirsute, strongly recurved horn about equaling the hood.

Type in the U. S. National Herbarium, no. 1,012,316, collected at Hacienda Buena Vista, about 20 miles east of Abasolo, Tamaulipas, Mexico, June 18, 1919, by E. O. Wooton.

Related to *Melampodium longicornu* A. Gray, which is a green annual, with broader leaves and longer horns on the fruits.

Melampodium argophyllum (A. Gray) Blake.

Melampodium cinereum var. *argophyllum* A. Gray; Robinson, Proc. Amer. Acad. **36:** 458. 1901.

This *Melampodium*, originally named but not characterized by Doctor Gray [7] in 1883, was again collected in mountains 24 kilometers west of Icamole, Nuevo León, February 3, 1907, by W. E. Safford (no. 1264). Mr. Safford's specimens agree perfectly with the type in the Gray Herbarium, *Palmer* 2068 (of 1880), collected in the Sierra Madre south of Saltillo, Coahuila. In its densely canescent-tomentose stems, leaves, and involucre the plant seems to differ specifically from the scabrously hispidulous but green *M. cinereum* DC.

Melampodium microcarpum Blake, sp. nov.

Erect, freely branched annual, 28 cm. high or more; stem stoutish, striate, rather densely hirsute with wide-spreading, several-celled, somewhat tuberculate-based hairs and more or less glandular-puberulous especially above; leaves opposite; petioles winged, hastate-auriculate at base and there 5 to 12 mm. wide, not connate, 1 to 2.5 cm. long; blades ovate or triangular-ovate, 4.3 to 5.5 cm. long, 2 to 3.3 cm. wide, acute or acuminate but the apex obtuse, abruptly and subtruncately contracted into the winged petiole, repand-serrate or repand-serrulate with low blunt teeth, rather densely scabrous-hispidulous and hispid above, the glandular-tuberculate bases of the hairs persistent, beneath lighter green, similarly pubescent with somewhat looser hairs, triplinerved; peduncles solitary in the forks and terminal, very slender, glandular-puberulous and rather sparsely hispid-pilose, 3.5 to 7 cm. long; heads at maturity 5 to 6.5 mm. wide; outer phyllaries usually 3, sometimes with 1 or 2 additional smaller ones, broadly ovate, obtuse, hispid-pilose and ciliate and more or less glandular-puberulous, 2 to 4 mm. long, 2 to 2.5 mm. wide; rays 8, the lamina suborbicular, yellow, hispid-pilose on back along the two chief veins, bidentate, 3 to 3.2 mm. long, 2.8 mm. wide; disk corollas yellowish, 2.5 mm. long, the cylindric tube 1 mm. long, glabrous, the campanulate throat 1 mm. long, glabrous, the teeth 0.5 mm. long, papillose-margined and with a tuft of inflexed hairs within below the apiculate apex; pales scarious, obtuse, fimbriatulate or denticulate at tip, 2.5 mm. long; fruits (ray achenes with their enfolding phyllaries) quadrate-oblong or oval-oblong, plump, 1.6 to 1.8 mm. long, truncate-rounded at apex, not hooded or beaked, somewhat contracted below the middle, about 1.2 mm. wide, rounded on the back, about 3-nerved on the sides, irregularly crustaceous-tuberculate on the sides and upper portion of the back, the tubercles depressed, bearing stiffish several-celled hairs.

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[7] A. Gray in S. Wats. Proc. Amer. Acad. **18:** 104. 1883.

Type in the U. S. National Herbarium no. 572555, collected in the vicinity of Gómez Farias, Tamaulipas, Mexico, altitude about 350 meters, April 13 to 21, 1907, by Edward Palmer (no. 319).

Related to *M. rosei* and *M. mimulifolium* Robinson, but differing widely from either in leaf outline and in the characters of the fruit, as well as its usually 3 phyllaries. The species is remarkable in having occasionally one or two smaller phyllaries in addition to the normal 3 of the outer cycle.

Parthenium densipilum Blake, sp. nov. PLATE 58.

Stout annual, about 35 cm. high, with numerous simple or subsimple, erect branches, leafy; stem and branches striate, very densely white-hirsute with spreading subtuberculate-based hairs about 2.5 mm. long; leaves alternate, obovate or oval in outline, sessile or narrowed into a petioliform base, 3 to 10 cm. long, 1.5 to 6 cm. wide, lyrately lobed or toothed, the terminal lobe large, obtuse, coarsely crenate-dentate, the lateral lobes 1 to 3 pairs, oblong, entire or toothed at apex, acute or obtuse, diminishing in size toward base of leaf, the blades papery, dull green above, rather densely hirsute with whitish hairs with yellowish white thickened bases, beneath densely hirsute with white hairs, the veins prominulous beneath; heads 3 to 5 mm. wide, in small terminal panicles 3 cm. wide or less, the pedicels about 3 mm. long, densely yellowish-strigose; involucre 3 mm. high, 2-seriate, the outer phyllaries 5, oblong to obovate-oval, obtuse, densely accumbent-hirsute with yellow hairs, subscarious at base and with shorter subherbaceous apex, the inner (subtending the rays) scarious, cuneate-suborbicular, broadly rounded, pubescent above with several-celled clavate hairs; rays 5, white, erect, bluntly 2-lobed, 1.2 mm. long, pubescent with few-celled clavate hairs; disk corollas numerous, white, 2.2 mm. long, nearly glabrous; pales of disk cuneate, subtruncate, 2.5 mm. long, densely pubescent at apex with several-celled clavate hairs; ray achenes obovate, obcompressed, blackish, 2 mm. long, pubescent above with short clavate hairs, deciduous with the subtending phyllary and the two opposed disk flowers with their pales; pappus of 2 triangular acutish paleae, about 0.8 mm. long, connate at base on outer side, pubescent with short clavate hairs.

Type in the U. S. National Herbarium, no. 1,012,317, collected at Hacienda Buena Vista, about 20 miles east of Abasolo, Tamaulipas, Mexico, June 16, 1919, by E. O. Wooton.

A member of the *Pathenium hysterophorus* group, well characterized by its very dense, spreading pubescence.

EXPLANATION OF PLATE 58.—*Parthenium densipilum*, from the type specimen. Natural size.

Parthenium parviceps Blake, sp. nov.

Suffrutescent or frutescent, 40 cm. high and more, the lower part not seen; stem slender, simple below the inflorescence, canescently arachnoid-tomentose, glabrate; leaves alternate; petioles 8 to 23 mm. long, narrowly margined, arachnoid-tomentose beneath; blades triangular-ovate, 5.5 to 9 cm. long, 3.5 to 6 cm. wide, acute, at base subtruncate, narrowly decurrent on the petiole, repand-dentate (teeth obtuse, 13 to 18 pairs), thick-papery, above deep dull green, very harshly tuberculate-hispidulous, beneath densely and canescently arachnoid-tomentose, triplinerved, the lateral veins about 6 pairs, with the secondaries reticulate beneath; panicle terminal, many-headed, 14 cm. wide, sordidly pilosulous-tomentulose, the pedicels 1 to 4 mm. long; heads 3 mm. high, 2.5 to 3.5 mm. thick; involucre 2-seriate, the outer phyllaries 5, suborbicular, 2 mm. long, rounded, pilosulous and short-ciliate, 3-nerved, the inner (subtending the rays) subscarious, orbicular, 3 mm. long, ciliolate and somewhat puberulous; rays 5, white, erect, emarginate, 1 mm. long; disk corollas white, sparsely puberulous at apex, 2.5 mm long; pales cuneate, subtruncate, 2.8 mm. long, densly puberulous at apex with short several-celled clavate hairs; ray achenes obovate, obcompressed, blackish, 1.6 mm. long, 0.9 mm. wide, pubescent chiefly on inner face and at apex with short

several-celled subclavate hairs, deciduous with the subtending phyllary and the two opposed disk flowers with their pales; pappus none.

Type in the U. S. National Herbarium, no. 840013, collected in rocky soil at Barranca de Tenampa, Zacuapan, Veracruz, Mexico, August, 1906, by C. A. Purpus (no. 1849).

Closely allied to *Parthenium fruticosum* Less., but distinguished by its smaller awnless achenes. In *P. fruticosum*, of which I have examined fragments in the Gray Herbarium from the type (*Schiede* 334), the achene is 2 mm. long, with two awns 0.5 mm. long. Nelson's no. 2965, from the State of Chiapas, agrees well with the type of *P. fruticosum*.

Zinnia leucoglossa Blake, sp. nov.

Slender or stoutish annual, ascending, or the main stem prostrate and sending out rootlets for much of its length, 50 cm. long or less, loosely or diffusely branched, fuscous-purplish, striatulate, hispid with several-celled erectish white hairs and more or less glandular-puberulous; leaves opposite; petioles 0.5 mm. long or less; blades linear to linear-oblong or -elliptic, 9 to 17 mm. long, 1.5 to 4.5 mm. wide, obtuse or rounded at both ends, thickish, entire, rather pale green, hispid on both sides with few-celled, glandular-tuberculate-based, ascending white hairs and somewhat gland-dotted, triplinerved; peduncles axillary and terminal, 1.5 to 8 cm. long, pubescent like the stem, very slightly or not at all enlarged just below the heads; heads 8 to 14 mm. wide; disk rounded at apex, 5 to 10 mm. high, 6 to 8 mm. thick; involucre 4-seriate, strongly graduate, 3 to 4 mm. high, the phyllaries oval, broadly rounded at apex, subindurate, greenish with slightly colorate apex, hispid-pilose over most of their exposed surface and more or less gland-dotted; rays 6 to 8, the lamina oval, bidenticulate, white, slightly green-tinged beneath toward apex, rather densely hispidulous outside with spreading hairs and more or less gland-dotted, 3.5 to 4.5 mm. long, 2.3 to 3.5 mm. wide; disk-corollas orange, the tube gland-dotted, 0.1 to 0.2 mm. long, the throat very slender, somewhat dilated near the middle, glabrous except at the narrowly funnelform apical portion, where hispid and gland-dotted, 3 mm. long, the teeth narrowly oblong, obtuse, hispid and tuberculate-glandular, 0.6 mm. long; receptacle slenderly subulate; pales obtuse, scarious, yellowish above, sparsely gland-dotted and with a few hairs along the keel, about 5.8 mm. long; ray achenes obcompressed, 1-ridged on the inner face, bidentate at the truncate apex, blackish, 2 mm. long, densely covered with glandular tubercles bearing short hairs; disk achenes strongly compressed, oblong, blackish, deeply and broadly emarginate at apex, sparsely appressed-hairy on the sides, densely hispid-pilose-ciliate on both margins, 2.3 mm. long; awn solitary, slender, hispidulous, 1.5 to 1.8 mm. long.

Type in the U. S. National Herbarium, no. 637065, collected in moist ravine, vicinity of Acaponeta, Tepic, Mexico, April 9, 1910, by J. N. Rose, P. C. Standley, and P. G. Russell (no. 14205).

ADDITIONAL SPECIMEN EXAMINED:

SINALOA: Sand dunes, vicinity of Rosario, April 15, 1910, *Rose, Standley, & Russell* 14629.

This species finds its only close relative in *Z. bicolor* Hemsl., from which it differs in its regularly ciliate disk-achenes. In *Z. bicolor* the achenes are bordered by a crustaceous margin irregularly broken up into teeth.

Heliopsis longipes (A. Gray) Blake.

Philactis longipes A. Gray, Proc. Amer. Acad. **15**: 35. 1879.

The genus *Philactis* Schrad. has hitherto been regarded as consisting of two species, *P. zinnioides* Schrad. and *P. longipes* A. Gray. The type species, *P. zinnioides*, has apparently not been re-collected since its description. It is characterized by its infertile disk achenes bearing a pappus of 4 unequal awns connate at base. In

P. longipes A. Gray, on the other hand, the disk achenes, as shown by submature examples of *Schaffner* 763/338, the only known collection besides the type (*Parry & Palmer* 465), are certainly fertile, and are epappose or bear (according to Gray) 2 or 4 minute teeth. In these features, as well as in habit, involucre, and floral characters, the species agrees perfectly with *Heliopsis*, and should be referred to that genus.

Rumfordia verapazensis Blake, sp. nov.

Herbaceous above, oppositely branched, the lower part not seen; stem stout, striate, obscurely pubescent or glabrous below, pilosulous above with several-celled eglandular loose dull whitish hairs; leaves opposite; petioles cuneate-winged, 6 to 30 mm. long, 5 to 10 mm. wide at apex, connate-clasping at base, pilose-ciliate; blades ovate or triangular-ovate, 8 to 11 cm. long, 3 to 8 cm. wide, sometimes with a very short and obscure deltoid lobe on one side near base, acuminate, at base broadly rounded or cuneate-rounded, then cuneately decurrent the whole length of the petiole, mucronulate-denticulate (teeth about 0.3 mm. high, 3 to 5 mm. apart), membranaceous, above deep green, evenly but sparsely pilose with loose several-celled hairs with persistent tuberculate bases, glabrescent, beneath lighter green, antrorsely short-pilose along veins and chief veinlets, gland-dotted on surface, triplinerved above the base, the veins and veinlets loosely prominulous-reticulate especially beneath; heads about 3 cm. wide, in ternately arranged panicles of about 7 at tips of stem and branches, on pedicels 1 to 3 cm. long, these densely spreading-pilose with many-celled loose whitish hairs and between them somewhat pilosulous-tomentulose; outer phyllaries 5, oval-ovate, 1.7 to 2 cm. long, 7 to 8.5 mm. wide, acuminate, spreading, thin-herbaceous, 3-nerved and prominulous-reticulate, contracted at base and short-connate, ciliate and along the veins spreading-pilose with many-celled hairs; inner phyllaries oblong-ovate, acuminate, 7.5 mm. long, rather densely stipitate-glandular and hispid-pilose with several-celled hairs, ciliolate, submembranous; rays (not well seen) yellow, pistillate, the tube 4.5 mm. long, pilose and stipitate-glandular, the lamina about 12 mm. long, 2.5 mm. wide; disk flowers fertile, their corollas yellow, on tube densely spreading-pilose with many-celled hairs and stipitate-glandular, sparsely so above, at maturity 7.5 mm. long (tube ampliate at base, 3.2 mm. long, throat slender-funneliform, 3.3 mm., teeth 1 mm.); pales broadly cuneate-obovate, abruptly acuminate, 5.5 mm. long, stipitate-glandular and hispidulous, ciliolate; achenes thick-obovoid, 1.8 to 2 mm. long, bluntly quadrangular or subtrigonous, blackish, glabrous, epappose.

Type in the U.S. National Herbarium, no. 408022, collected near the Finca Sepacuité, Alta Verapaz, Guatemala, March 28, 1902, by O.F. Cook and R. F. Griggs (no. 239).

Allied to the Mexican *Rumfordia oreopola* Robinson, which has narrower, sharply acuminate leaves with one to three acuminate lateral teeth on each side toward the base.

Sclerocarpus columbianus Rusby & Blake, sp. nov.

Herbaceous (?), 0.3 to 1 meter high, above simple or sparsely branched, the stem striate, hispid-pilose with spreading or ascending hairs, and more or less short-pilose with several-celled hairs; leaves opposite below, alternate above; petioles slender, 1 to 2.2 cm. long, hispid-pilose and hispidulous; blades ovate, 3.5 to 7.5 cm. long, 1.8 to 4 cm. wide, acute or acuminate, at base cuneate or rounded-cuneate and narrowly decurrent on the petiole, crenate-serrate or serrulate above the base with about 18 pairs of bluntish teeth, thin, above dull green, densely hispidulous and hispid-pilose with ascending hairs (the larger tuberculate-based), beneath paler green, densely hispid-pilose with scarcely tuberculate-based hairs, triplinerved, only the primary and chief secondary nerves prominulous beneath; peduncles solitary, terminal, pubescent like the stem, 1.8 to 3.8 cm. long, sometimes bearing a single bract below the head; heads about 12 mm. wide, 10 mm. high; involucre nearly 1-seriate or distinctly 2-seriate, the phyllaries about 10, unequal, elliptic-obovate or

the larger elliptic, 7 to 20 mm. long, 2 to 5 mm. wide, rather densely hispid-pilose with ascending hairs, acute, herbaceous, ribbed at base or nearly to apex, the outer sometimes much larger than the inner and spreading; rays yellow, neutral, the tube hispidulous, 2.2 mm. long, the lamina suborbicular, tridentate to deeply 2-lobed, 3 to 3.5 mm. long, 3 to 4 mm. wide, hispidulous on the back, 13-nerved; disk corollas yellow throughout, 4.8 to 5.8 mm. long, hispidulous especially above, the tube about 1 mm. long, passing gradually into the very slenderly funnelform throat, the lanceolate acute teeth 1 to 1.2 mm. long, hispidulous-barbate within below the apex with colorless hairs; fruits (achenes with their enclosing pales) all beaked, obovoid, 5.5 to 7 mm. long (the beak 1.5 to 2 mm. long), indurated, ribbed, and often transverse-rugulose above, appressed-pubescent above; achene obliquely obovoid, with short, whitish, stipe-like base, 4 to 5.5 mm. long, 1.5 to 1.8 mm. wide, somewhat sulcate on the sides, olivaceous or blackish brown, epappose, glabrous.

Type in the herbarium of the New York Botanical Garden, collected in thicket on irrigated land near the sea at Cienaga, vicinity of Santa Marta, Colombia, September 6 to 12, 1898–1899, by Herbert H. Smith (no. 518). Duplicate in the U. S. National Herbarium.

This species is described on the collector's label as suffruticose, but is probably herbaceous. It was apparently rare, as it was observed at only one locality. *Sclerocarpus columbianus* is most nearly related to *S. phyllocephalus* Blake, of Guatemala, but may be distinguished by the usual lack of leaflike bracts at the base of the involucre, by the smaller disk corollas with shorter teeth, and by the larger achene.

Montanoa rekoi Blake, sp. nov.

Large tree, the trunk up to 0.5 meter thick; branches slender, obscurely angled, appressed-pilose when very young, quickly glabrate; internodes 2 to 5 cm. long; leaves opposite; petioles slender, naked, glabrous, 1.5 to 6 cm. long; blades elliptic-lanceolate (smaller) to oval-ovate or subrhombic-ovate, 8.5 to 19 cm. long, 2.3 to 9.5 cm. wide, unlobed or the larger with a short acute lobe on one or both sides above the middle, acuminate or attenuate, acuminately cuneate at base, serrulate or crenate-serrate above the entire lower portion, papery or subpergamentaceous, equally green on both sides, above somewhat shining, sparsely and minutely strigillose with lepidote-based hairs, in age lepidote and rough, beneath densely griseous-pilosulous and dotted with shining brown glands at first, soon perfectly glabrous, triplinerved well above the base; heads discoid, 4-flowered, very numerous in a dense, rounded, terminal panicle 6.5 cm. wide, its branches and the pedicels (2 to 4 mm. long) densely pilosulous; bracts minute; disk in anthesis 5 mm. high, 2.5 mm. thick; outer phyllaries 4 or 5, ovate, erect, unequal, the larger 2 to 2.5 mm. long, 1.1 to 1.5 mm. wide, acutish, pilosulous and ciliate; corollas white, glandular and pilosulous with several-celled hairs above, 3.6 mm. long (tube 1.2 mm., throat subcampanulate, 1.5 mm., teeth 0.9 mm.); pales (submature) ovate, 5.8 mm. long, 2.5 mm. wide (when flattened out), gradually narrowed into the erect cuspidate tip, densely long-villous and villous-ciliate; achenes (submature) thick-quadrangular, glabrous, epappose, 1.3 mm. long.

Type in the U. S. National Herbarium, no. 1,012,313, collected at Apango, Oaxaca, Mexico, altitude 450 meters, October 11, 1917, by B. P. Reko (no. 3534). Duplicate, consisting of a sterile branch with larger leaves than the type, also in the National Herbarium. Also collected by Reko (no. 3160) at the same locality, April 20, 1912.

Doctor Reko describes this as a big tree, up to half a meter in diameter, with cork-like bark. It contains a rosin or camphor-like substance which burns like pitch, and has crystallized on the younger parts of one of the specimens examined. The species bears the vernacular names "yagazeche" and "ocotillo." On the sheet of sterile specimens the collector has noted the color of the flowers as yellow, but if this sheet (the larger leaves of which are described above) really belongs to this species, as it seems clearly to do, the flowers are surely white.

This remarkable species finds its only close ally in *Montanoa anomala* Robins. & Greenm., of Veracruz, in which the uppermost leaves (the only ones known) are suborbicular, broader than long, puberulent and scabrous above and rusty-tomentose beneath, while the phyllaries are linear to linear-lanceolate.

Montanoa subglabra Blake, sp. nov.

Shrub with opposite spreading branches; stem stout, terete, pithy, somewhat appressed-puberulous, quickly and completely glabrate; internodes 0.6 to 4 cm. long; leaves opposite; petioles slender, naked, at first puberulous, quickly and completely glabrate except on the sulcate upper side, 1 to 3 cm. long; leaf blades rhombic or rhombic-ovate, 6.5 to 13 cm. long, 2.8 to 8 cm. wide, often with a pair of short, deltoid, erect, mucronulate lobes near middle, acuminate, crenate-serrulate above the usually entire acutely cuneate base (teeth very depressed, mucronulate, 3 to 8 mm. apart), papery, above deep dull green, harshly and sparsely hispidulous with mostly deciduous hairs with persistent lepidote-tuberculate bases, beneath in extreme youth densely cinereous-tomentulose, quickly becoming perfectly glabrous and green, or sometimes with a few persistent hairs in the axils of the veins, triplinerved above the base, loosely prominulous-reticulate beneath; panicles large, 7 to 20 cm. wide, very many-headed, ternately divided, accumbent-pilosulous, the pedicels 2 to 6 mm. long, the ultimate bracts minute; heads about 9 mm. wide, the disk in mature flower 5 to 6 mm. high, about 6 mm. thick; outer phyllaries 5, ovate, obtuse to acute, 2.2 mm. long, 1.2 mm. wide, densely ciliate, on back densely pilose or glabrescent above; rays about 4, white, the lamina oval, 4 to 4.5 mm. long, 2.2 mm. wide; disk flowers about 12, their corollas white, stipitate-glandular and pilosulous chiefly above, 3.2 to 4 mm. long; pales (immature) densely villous and villous-ciliate, the body 1.8 mm. long, rather abruptly contracted into an erect or recurved, lanceolate, acuminate cusp 1.8 mm. long.

Type in the U. S. National Herbarium, no. 252627, collected near Neutón, Guatemala, altitude 915 to 1,220 meters, December 13 to 15, 1895, by E. W. Nelson (no. 3536). Also collected by Nelson at the same locality and date under no. 3513.

Related to *Montanoa myriocephala* Robins. & Greenm. and *M. xanthiifolia* Schultz Bip.; distinguished from the former by its quickly glabrate stem and lower leaf surface, five phyllaries, fewer rays, and more numerous disk flowers, and from the latter by its merely puberulent, quickly glabrate petioles, and leaves of somewhat different shape.

Montanoa arsenei Blake, sp. nov.

Stem herbaceous above, oppositely much-branched, stoutish, subterete, densely and sordidly subtomentose-pilosulous and -pilose with chiefly spreading hairs; leaves opposite; petioles densely sordid-pilosulous and more sparsely pilose, naked, 5 to 12 mm. long; leaf blades lanceolate to lance-ovate or lance-obovate, the larger 6 to 12 cm. long, 1.5 to 4 cm. wide, acuminate, at base truncate and often very unequal, occasionally with a small tooth on one or both sides at base, crenate-serrate with depressed teeth or the upper subentire, papery, above deep green, rather harshly and very densely tuberculate-hispidulous and sparsely glandular, beneath evenly and rather densely hispidulous-pilosulous with spreading griseous hairs and densely dotted with shining brownish glands, along the chief veins densely and sordidly hirsute-pilose with short several-celled hairs, triplinerved 1 to 2 cm. above the base and rather densely prominulous-reticulate beneath; heads very numerous, subternately arranged, about 2 cm. wide in flower, in fruit subglobose and (disk) about 1.6 cm. wide, on erect or in fruit somewhat decurved pedicels mostly 1 to 4 cm. long; outer phyllaries 7, spreading or recurved, lanceolate or linear-lanceolate, obtuse or acutish, often callous-apiculate, herbaceous, densely sordid-pilosulous, in flower 4 to 6 mm. long, in fruit 7 to 10 mm.; rays 7, white, the lamina obovate, 3-denticulate, about 11 mm. long, 6 mm. wide; disk corollas white, gland-dotted and sparsely

short-pilose with several-celled hairs, 3.8 mm. long (tube 0.8 mm., throat 2 mm., teeth 1 mm.); fruiting pales scarious, inflated, about 8 mm. long, rather gradually narrowed into the spreading or reflexed cùspidate apex (cusp 0.5 to 0.8 mm. long), somewhat gland-dotted, otherwise essentially glabrous except for the slightly ciliolate apex; achenes glabrous, epappose, 3 mm. long.

Type in the U. S. National Herbarium, no. 1,000,576, collected at Rincón, near Morelia, Michoacán, Mexico, altitude 1,900 meters, September 8, 1910, by G. Arsène (no. 5290).

Allied to *Montanoa frutescens* (Mairet) Hemsl., which has glabrous or early glabrate branches and stiffer pales; also to *M. purpurascens* Robins. & Greenm., which has leaves with cuneate base and of different outline; and to *M. uncinata* Schultz Bip., which has different pales and leaves.

Montanoa pilosipalea Blake, sp. nov.

Stem herbaceous above, stoutish, subterete, oppositely branched, densely and sordidly tomentose-pilose with loosely spreading hairs; leaves opposite; petioles densely sordid-tomentose, sometimes glabrescent beneath, broadened below, essentially naked except toward apex, 8 to 18 mm. long; leaf blades triangular-ovate, 3.5 to 7 cm. long, 1.3 to 4 cm. wide, with 1 or 2 pairs of broad blunt triangular teeth or lobes near base or the smaller subentire, acuminate, short-decurrent on petiole from a broadly rounded or truncate base, with essentially entire or obscurely few-serrulate margin, pergamentaceous, above dull green, densely and somewhat harshly hispidulous-pilosulous (the hairs with persistent tuberculate bases), and along the chief veins densely and sordidly pilosulous-tomentulose, beneath densely and griseously pilosulous-tomentose with incurved hairs, triplinerved above the base, the secondaries mostly concealed beneath by the tomentum; panicles flattish-topped, many-headed, the terminal one 15 cm. wide; pedicels at maturity deflexed at apex, 1 to 2 cm. long; heads in fruit subglobose, the disk 1 cm. high, 1.3 cm. thick; outer phyllaries 5 or 6, in fruit lanceolate or lance-ovate, 4 to 5 mm. long, 1.2 to 1.5 mm. wide, spreading or recurved, obtuse or acutish, callous-tipped, pilosulous; rays white, the lamina elliptic, bidenticulate, 7 mm. long, 2.5 mm. wide; disk corollas white, gland-dotted and hispidulous chiefly above, 3.2 to 3.5 mm. long; body of the fruiting pales obovate-oblong, scarious, 7 to 8 mm. long, glandular, loosely long-pilose, densely pilose-ciliate above (the hairs nearly 1 mm. long), abruptly contracted into a firm spreading or slightly recurved cusp 1.5 to 1.8 mm. long; achenes obovoid, thickened, glabrous, blackish, epappose, 3.2 mm. long.

Type in the U. S. National Herbarium, no. 1,000,580, collected at Fort de la Guadalupe, vicinity of Puebla, Puebla, Mexico, altitude 2,170 meters, November 11, 1906, by G. Arsène (no. 268a).

Nearest to *Montanoa uncinata* Schultz Bip. and *M. patens* A. Gray, but distinguished from both by its loosely and rather densely pilose and ciliate, longer-cuspidate pales.

Montanoa affinis Blake, sp. nov.

"Shrub 3 meters high;" stem herbaceous above, slender, sparsely and obscurely strigillose, subterete, the opposite obscurely ancipital branches spreading at a right angle; leaves opposite; petioles very slender, naked, obscurely strigillose, 1.5 to 4.5 cm. long; leaf blades broadly ovate or suborbicular-ovate, 7 to 11 cm. long, 4.5 to 8 cm. wide, short-acuminate, at base rounded-cuneate to subtruncate and somewhat unequal, the larger with a pair of short blunt lateral lobes near middle, remotely crenate with broad depressed mucronulate teeth, membranaceous, above deep green, very harshly and evenly but sparsely tuberculate-hispidulous with mostly deciduous hairs with persistent bases, beneath equally green, sparsely strigillose or hispidulous along the chief veins, and on surface sparsely gland-dotted, triplinerved or 3-nerved, the chief veins prominulous beneath; panicles ternately divided, terminating

branches and branchlets, the individual ones 6 to 8 cm. wide, about 12-headed, loose. the pedicels finely hispidulous with chiefly appressed hairs, usually 0.5 to 2 cm. long; heads in flower 1.7 to 2 cm. wide; disk about 5 to 6 mm. high and thick; outer phyllaries 5, oblong or ovate, obtuse, 2 to 3.5 mm. long, 1.5 to 2 mm. wide, herbaceous, 3-nerved, finely strigillose; rays 5, "white," the lamina broadly cuneate-obovate or broadly oval, emarginate, about 8 mm. long, 6 mm. wide, on back stipitate-glandular; disk corollas about 22, stipitate-glandular, about 3.6 mm. long (tube 0.6 mm., throat cylindric-campanulate, 2 mm., teeth ovate, 1 mm.); pales (immature) turbinate-cymbiform, rather loosely inclosing the achenes, stipitate-glandular and along midline pubescent with short several-celled hairs, the body 2.2 mm. long, the truncate-rounded apex abruptly contracted into an erect or slightly incurved mucronate-tipped point about 0.7 mm. long; achenes (immature) obliquely compressed-turbinate, 4-angled, with broad truncate apex, epappose, glabrous, 1.5 mm. long.

Type in the U. S. National Herbarium, no. 386076, collected in granitic soil at El Ocote, Michoacán or Guerrero, Mexico, altitude 100 meters, November 12, 1898, by E. Langlassé (no.621).

In the absence of mature pales the exact position of this species is somewhat uncertain, but it seems to be rather closely related to *M. subtruncata* A. Gray, in which the leaves are rather densely hispidulous-pilosulous beneath on all the veins and veinlets. The vernacular name of *M. affinis* is given as "flor de San Francisco."

Isocarpha cubana Blake, sp. nov.

Annual, erect or ascending, or sometimes procumbent and rooting at base, 10 to 60 cm. high; stem rather slender, puberulous with several-celled, incurved or somewhat spreading, eglandular hairs, usually freely branched, with divaricate to erectish branches; internodes usually much longer than the leaves; leaves mostly opposite, the uppermost and those of the branches usually alternate; petioles winged, 8 to 25 mm. long, 1 to 6 mm. wide, entire, dilated at base into dentate auricles 2 to 24 mm. wide; blades triangular-ovate, 1 to 5 cm. long, 0.6 to 4.3 cm. wide, acute to obtusish, subtruncate to cuneate at base and decurrent on the petiole, crenate-dentate with mostly obtuse teeth, membranaceous, sparsely pilosulous above, glabrescent except along costa and margin, beneath pilosulous along veins and veinlets, sometimes also on surface, with spreading several-celled hairs, and densely sessile-glandular with shining glands, weakly triplinerved, the veins prominulous beneath; upper leaves and branch leaves much smaller; heads discoid, usually very numerous, the pedicels mostly 0.8 to 3 cm. long, pubescent like the stem; disk ovoid becoming ellipsoid, 6 to 9 mm. long, 4 to 5 mm. thick, acutish becoming obtuse; involucre about 2-seriate, slightly graduate, 2.5 to 3 mm. high, appressed, the phyllaries ovate-lanceolate to oblong, acute or the outer subacuminate, thin-herbaceous, 1-costate at base for about one-third their length, rather densely spreading-puberulous and ciliolate with several-celled eglandular hairs and sparsely sessile-glandular; corollas white, essentially glabrous, 2 mm. long (tube 0.6 mm., throat slightly broader, 1.1 mm., teeth 0.3 mm.); pales cuneate-oblong, 2.2 mm. long, apiculate at the subtruncate apex, ciliolate and on back sessile-glandular; achenes prismatic, 5-angled, with conspicuous but short inflexed carpopod, blackish, densely spreading-puberulous on the angles, 1 mm. long; style branches with elongate, linear, hispidulous appendages.

Type in the U. S. National Herbarium, no. 521866, collected near Nueva Gerona, Isle of Pines, south of Cuba, December 19, 1903, by A. H. Curtiss (no. 246).

ADDITIONAL SPECIMENS EXAMINED:

CUBA: Without definite locality, *Wright* 2857. Province of Pinar del Rio: *Baker & Abarca* 4201; *Britton & Cowell* 9825; *Shafer* 10737, 11237. Province of Camaguey: *Shafer* 348, 958. Province of Oriente: *Pollard & Palmer* 318; *Britton* 1998; *Shafer* 1565, 12393.

This species has been confused with *Isocarpha divaricata* Benth. and *I. atriplicifolia* (L.) R. Br., and the material cited has been distributed under both names *Isocarpha divaricata* Benth., of which *I. blepharolepis* Greenm.[8] is a synonym, is only known from Ecuador and Peru. It is at once distinguished from the *I. atriplicifolia* group by its exauriculate petioles and glabrous achenes. The *I. atriplicifolia* group consists of three species, distinguished by the following characters:

ISOCARPHA CUBANA Blake.—Phyllaries green, merely acute or subacuminate, the simple costa conspicuous only in the lower third or not at all; pales merely apiculate or obtusish; achenes 1 mm. long. Cuba and Isle of Pines.

ISOCARPHA ATRIPLICIFOLIA (L.) R. Br.—Phyllaries acuminate, puberulous and ciliate with chiefly eglandular hairs, the prominent double whitish costa continued nearly to apex; pales acute, ciliate, the hairs at apex chiefly eglandular; achenes about 1.5 mm. long; pedicels puberulous, obscurely if at all stipitate-glandular. Guerrero (*Palmer* 534 of 1894–5; *Nelson* 2267) to Costa Rica (*Pittier*). Hitherto wrongly referred to *I. divaricata*.

ISOCARPHA BILLBERGIANA Less.—Phyllaries long-acuminate, costate as in *I. atriplicifolia*, stipitate-glandular on back and margin, the eglandular hairs few or wanting; pales abruptly short-acuminate, ciliate with chiefly gland-tipped hairs; achenes 1.5 mm. long; pedicels conspicuously stipitate-glandular. Colombia (*Smith* 678) and Trinidad (*Kuntze*, April, 1874). Hitherto confused with *I. atriplicifolia*. Lessing's type, collected by Billberg, came from Tierra Bomba, near Carthagena, Colombia.

Mr. J. Hutchinson, of the Kew Herbarium, to whom heads of the three species above described were sent, has kindly compared them with the type of *Bidens atriplicifolia* in the Linnaean Herbarium and reports that *Nelson* 2267 is an exact match. Linnaeus gave as the locality for his species "America meridionali. *Miller*."

Isocarpha glabrata Blake, sp. nov.

Suffrutescent, about 25 cm. long, apparently procumbent, much branched; stem slender, like the branches green and glabrous; internodes 5 to 23 mm. long; leaves opposite, or the uppermost scattered, linear-oblanceolate, 1.7 to 2.3 cm. long, 1.5 to 3 mm. wide, acute or obtusish, tapering into the short petioliform base, entire, somewhat fleshy, green on both sides and glabrous except for a few loose hairs along the slightly revolute margin, triplinerved; heads discoid, solitary or in pairs at apex of stem and branches, the peduncles glabrous, 2.5 cm. long to almost obsolete, bearing 1 or 2 lanceolate bracts just below the heads; disk turbinate, about 5 mm. high and thick, convex at maturity; involucre about 2-seriate, scarcely graduate, 4 mm. high, the phyllaries few (grading into the pales), lanceolate to oblong-lanceolate, acuminate or acute, callous-mucronate, whitish-green, about 3-ribbed, narrowly scarious margined, sparsely gland-dotted, otherwise glabrous; corollas white, sparsely stipitate-glandular at base of throat, 2.5 mm. long (tube 0.7 mm., throat 1.1 mm., teeth 0.7 mm.); pales oblong, shortly callous-apiculate from the rounded to emarginate apex, stiff, whitish, with 2 strong white ribs and 3 green vittae, somewhat gland-dotted, otherwise glabrous, the scarious margin erose; achenes obovoid-oblong, 1.5 to 1.8 mm. long, 5 or 6-ribbed, glabrous, brownish, truncate, epappose, with short but conspicuous whitish carpopod.

Type in the U. S. National Herbarium, no. 848745, collected on the Silla de Cayo, Cayo Romano, Camaguey, Cuba, October 9 to 11, 1909, by J. A. Shafer (no. 2513).

Closely related to *Isocarpha oppositifolia* (L.) R. Br., from the smoother forms of which it is distinguished by the entire absence of hairs (aside from the glands) on the surface and margins of the phyllaries and pales.

Sabazia leiachaenia Blake, sp. nov.

Slender annual, 6 to 10 cm. high, simple or with few erect or ascending branches; stem purplish-tinged, strigose with white hairs and pilose with spreading purplish

[8] Field Mus. Bot. 2: 347. 1912.

gland-tipped hairs; leaves about 4 pairs, opposite, subsessile, the blades lance-ovate or lanceolate to (upper) linear-lanceolate, 8 to 18 mm. long, 2 to 7.5 mm wide, obtuse, cuneate at base, serrate with 1 to 3 pairs of lanceolate, callous-tipped, salient teeth, triplinerved, thickish, green both sides, sparsely pilose along costa above and hispid-pilose-ciliate with basally thickened hairs, beneath ascending-pilose along costa, on surface sparsely pilose with weak gland-tipped hairs; penduncles terminal and axil lary, pubescent like the stem, 2.5 to 3.5 cm. long; heads 1.2 to 1.4 cm. wide, hemispheric; involucre 2-seriate, equal, 3.5 to 4 mm. high, the phyllaries few, submembranous, purplish, ovate or oval-ovate, rounded, pilose chiefly below with mostly gland-tipped hairs, above glandular-ciliate; rays 8, fertile, the lamina quad-rate, 3-toothed, purplish outside, white within, or apparently sometimes white on both sides, the limb 4 mm. long, 3.2 mm. wide, the tube (1 mm. long) densely pilose; disk flowers numerous, the corollas pale yellow, 2 mm. long, the densely pilose tube 0.5 mm. long, the campanulate essentially glabrous throat 1.2 mm. long, the deltoid papillose teeth 0.3 mm. long; pales glabrous, 2.8 mm. long, divided nearly to base into 3 narrowly linear acuminate lobes, the middle one broader and longer than the lateral; ray achenes obovoid, plumpish, blackish, glabrous, epappose, striatulate, finely cross-wrinkled, 1.2 mm. long; disk achenes similar, glabrous, 1.2 mm. long, their pappus of 10 oblong, obtuse, spinulose-fimbriate, persistent, equal squamellae 1 mm. long.

Type in the U. S. National Herbarium, no. 451536, collected on the Nevada de Toluca, State of Mexico, Mexico, October 15, 1903, by J. N. Rose and J. H. Painter (no. 7918).

The only close relative of this species is *S. anomala* Greenm., in which both the ray and the disk achenes are hispidulous and bear a pappus.

Sabazia radicans Blake, sp. nov.

Herbaceous, perennial (?); stems slender, striatulate, greenish, procumbent and rooting at the nodes below, ascending above, sparsely branched, about 45 cm. long, glabrous below, sparsely hispid-pilose above with appressed or ascending hairs; inter-nodes 7 to 11 cm. long; leaves opposite; petioles slender, naked, very sparsely hispid-pilose, 10 to 15 mm. long; blades lance-ovate, 3 to 5 cm. long, 1.5 to 2.5 cm. wide, acuminate, cuneate to rounded at the unequal base, bearing 3 or 4 coarse ascending teeth on each side near the middle, membranaceous, triplinerved and loosely reticu-late beneath, green on both sides, above and on margin sparsely hispid-pilose with several-celled, tuberculate-based, ascending hairs, beneath very sparsely hispid-pilose chiefly on the veins; peduncles solitary, terminal, rather densely hispid-pilose with mostly appressed hairs, 8 to 16 cm. long; heads 1.6 to 2 cm. wide; disk 5 to 6 mm. high, 7 mm. wide; involucre 2 or 3-seriate, equal, 4 to 4.5 mm. high, the phyllaries few, oval-ovate, obtuse, green, submembranous, striatulate, densely ciliolate with sub-glandular hairs and sparsely puberulous toward apex with similar hairs; rays 8, pinkish-white (when dried), the lamina cuneate-obovate, tridentate, nearly glabrous, 8 mm. long, 4 mm. wide; disk corollas pale yellow, sparsely papillose-hispidulous, 2.5 to 2.8 mm. long (tube 0.7 mm., teeth 0.5 to 0.7 mm.); pales lance-elliptic, rather abruptly acuminate, spinulose-denticulate, 4 mm. long; ray achenes obovoid-oblong, hispidulous especially on margin and at apex, epappose, 2 mm. long; disk achenes (immature) similar.

Type in the U. S. National Herbarium, no. 461423, collected near Trinidad Iron Works, Hidalgo, Mexico, altitude 1,570 meters, on wet banks, July 11, 1904, by C. G. Pringle (no. 8943).

Sabazia radicans is distinguished from *S. sarmentosa Less.*, under which name the type was distributed, by its much less pubescent leaves and stems. The latter species, moreover, has glabrous achenes, according to DeCandolle.

Sabazia triangularis Blake, sp. nov.

Trailing herbaceous perennial; stems subsimple or sparsely branched, rooting at the lower nodes, with ascending tips, about 80 cm. long, striate, rather sparsely pilose especially above with loosely ascending or spreading few-celled hairs; inter-

nodes 3 to (uppermost) 10 cm. long; leaves opposite; petioles densely spreading-pilose on upper side, 1 to 2 cm. long; blades triangular-ovate or the uppermost lance-ovate, 3.5 to 5 cm. long, 2 to 2.5 cm. wide, acuminate nearly from the base, truncate-rounded at base, serrate with 8 to10 pairs of depressed mucronulate teeth, membranous, triplinerved, above rather densely pilose with several-celled, subtuberculate-based, lucid, ascending hairs, beneath slightly paler green, rather densely pilose with loosely ascending hairs; peduncles terminal and axillary toward tip of stem, monocephalous, densely ascending-pilose especially above, with a few gland-tipped hairs intermixed, 5 to 9 cm. long; heads 1.8 cm. wide; disk 7 to 8 mm. high and thick; involucre 3-seriate, graduate, 6 to 7 mm. high, the phyllaries oval or ovate-oval, obtuse, or the outermost lance-ovate, green, submembranous, lineate, ciliolate nearly or quite throughout; rays 8, the lamina cuneate or cuneate-suborbicular, 3-lobed, purplish outside, white within, 5 to 7 mm. long, 4.5 mm. wide, the tube densely pilose; disk corollas pale yellowish, 3 mm. long (tube 0.8 mm., teeth 0.6 mm.), rather densely hispidulous chiefly on tube and teeth; pales lance-elliptic, acuminate, with a tooth on one side, spinulose-denticulate, 4.5 mm. long; ray achenes (immature) clavate, glabrous, epappose, 2 mm. long; disk achenes (immature) clavate, rather densely hispidulous, epappose, 2 mm. long.

Type in the U. S. National Herbarium, no. 677499, collected in humid ravine around El Potrero Camp, Chiriquí Volcano, Panama, altitude 2,800 to 3,000 meters, March 10 to 13, 1911, by H. Pittier (no. 3109).

Sabazia triangularis is allied to *S. sarmentosa* Less. and *S. radicans* Blake, but is distinguished by the outline and pubescence of its leaves and by the fact that the ray achenes are glabrous while those of the disk are hispidulous.

Wedelia oxylepis Blake, sp. nov.

Herbaceous above, 45 cm. high and more, the lower portion not seen; stem slender, hispid, particularly near the nodes, with spreading or deflexed mostly deciduous hairs with persistent swollen bases, and spreading-hispidulous; internodes 7 to 9.5 cm. long; leaves opposite throughout; petioles pubescent like the stem, 4 to 8 mm. long; blades ovate, 5 to 7.5 cm. long, 1.5 to 3 cm. wide, acuminate, cuneate at base, serrate or serrulate (teeth 8 to 15 pairs, acute, coarse or small and depressed), papery, above deep green, harshly hirsute-hispid, and hirsutulous with antrorse hairs, the larger with lepidote-tuberculate bases, beneath somewhat lighter green, on surface evenly but not densely hirsutulous, along the veins hirsute-hispid, triplinerved, the lateral veins about 4 pairs, prominulous beneath, the secondaries scarcely prominulous; heads about 2.3 cm. wide, solitary in the upper axils and ternate at apex of stem, the peduncles 3.5 to 11 cm. long, very densely spreading-hirsutulous and less densely hirsute-hispid; disk 10 to 11 mm. high, 10 to 12 mm. thick; involucre 2-seriate, subequal, 9 to (fruit) 13 mm. high, the phyllaries oblong-lanceolate (1.5 to 4 mm. wide), acute or acuminate, erect, with pale, indurate, essentially ribless base and longer herbaceous tip, antrorsely tuberculate-hispid and hispidulous, hispid-ciliate with spreading hairs; rays 12, yellow, fertile, the lamina oval, bidentate, 9 mm. long, 4 mm. wide; disk corollas yellow, sparsely hispidulous at apex of tube and on teeth, slenderly obconic, 5 to 6.2 mm. long (tube 1.8 to 2.6 mm., throat 2.5 to 2.8 mm., teeth 0.8 mm.); pales obtuse or acute, 1-dentate on each side below apex, carinate from base to below the apex (the keel glabrous except at the erose-ciliolate tip), erose-ciliolate above, purplish along keel, about 6.5 mm. long; ray achenes trigonous, quadrate-oblong in outline, 3-winged, 3 mm. long, 2.2 mm. wide, glabrous, their pappus a crown of lacerate, connate squamellae 0.2 mm. long; disk achenes oblong, elliptic in cross-section, crustaceous-margined but not winged, crustaceous-tuberculate, hispidulous, 3.5 mm. long, 1.5 mm. wide, bluntly and shortly 2-toothed at apex, their pappus a crown of lacerate, connate squamellae about 0.15 mm. high, borne on a short thick neck 0.3 mm. long, 0.7 mm. wide.

Type in the U. S. National Herbarium, no. 1,023,399, collected in the vicinity of Durán, near Guayaquil, Ecuador, November 5 to 8, 1918, by J. N. Rose and G. Rose (no. 23599).

Allied to *Wedelia helianthoides* H. B. K., also Ecuadorian, which has much shorter phyllaries, exceeded by the pales, and smooth disk achenes. Related also to *Wedelia latifolia* DC., collected by Bertero at an unknown locality in South America, to which I refer the recently described *Wedelia heterophylla* Rusby[9] and *W. symmetrica* Rusby,[10] from Colombia. In *W. latifolia* the disk achene is considerably larger with a much more conspicuous pappiferous neck.

Aspilia macrolepis Blake, sp. nov.

"Climbing;" branches herbaceous, brownish, subterete, tuberculate-strigose, or tuberculate-hispid with ascending hairs; leaves opposite; petioles naked, sulcate, 1 to 1.3 cm. long, tuberculate-hispid-pilose; blades ovate, 8.5 to 10.3 cm. long, 3 to 4 cm. wide, falcate-acuminate, at base broadly rounded, subpapyraceous, repand-denticulate with about 7 pairs of minute teeth, above deep green, sublucid in age, evenly but not densely strigose with subtuberculate-based hairs, beneath paler and duller green, similarly pubescent, triplinerved about 8 mm. above the base, the secondaries about 15 pairs, spreading nearly at right angles, somewhat prominulous; peduncles axillary, 13 to 15.5 cm. long, pubescent like the stem, bearing at apex 3 heads, subsessile or on densely spreading-hispid-pilose pedicels 1.7 cm. long or less; bracts lance-linear, 2 cm. long; heads 17 mm. wide, the disk 12 mm. high, 1 cm. wide; involucre obgraduate, the two outermost series of phyllaries (about 6) lanceolate, 12 to 18 mm. long, 2 to 3 mm. wide near base, herbaceous essentially throughout or indurated at extreme base, strigose, reflexed from near the base; the inner two series oblong, obtuse, dryish with submembranous tips, finely puberulous above and ciliolate, 8 to 9 mm. long; rays about 8, yellow, neutral, the lamina oval, 5 mm. long, essentially glabrous; disk corollas numerous, yellow, narrowly funnel-form, papillose at apex of teeth, otherwise glabrous, 5.5 mm. long (the indistinct tube 1.2 mm.); pales narrow, subscarious, 9 mm. long, acuminate, carinate, sparsely ciliate on keel below, spinulose-ciliolate above and on keel; achenes (immature) linear, very narrowly winged, ciliate and ascending-pilose, 5 mm. long; awns 2, lanceolate, upwardly pubescent, 1.2 mm. long, united at base to the corona; corona of basally united deeply lacerate-fimbriate squamellae 0.8 mm. long.

Type in the U. S. National Herbarium, no. 531083, collected on hills of Miraflores, above Palmira, in the central Cordillera, State of Cauca, Colombia, January, 1906, by H. Pittier (no. 893).

This species may be recognized by its elongate and reflexed herbaceous outer phyllaries, strigose stem, and peculiar inflorescence.

Aspilia patentipilis Blake, sp. nov.

"Herb," sparsely branched, the stem slender, terete, striatulate, fuscous-brown, densely short-pubescent with spreading, several-celled, subglandular hairs and hispid-pilose with spreading whitish hairs about 5 mm. long; leaves opposite; petioles naked, very densely pubescent like the stem, 6 to 9 mm. long; blades ovate, 7 to 8.5 cm. long, 2.5 to 3.8 cm. wide, falcate-attenuate, at base rounded, entire, above brownish-green, slightly shining in age, tuberculate-hispidulous and more sparsely spreading-hispid-pilose, beneath paler green, rather densely subtuberculate-hispidulous, along the veins short-hispid and sparsely hispid-pilose with long spreading hairs, rough on both sides, submembranous, triplinerved about 5 mm. above the base and somewhat prominulous-reticulate beneath, the veins impressed above; peduncles solitary, axillary, monocephalous, 8.5 to 11 cm. long, pubescent like the stem; heads about 2.5 cm. wide; disk 12 mm. high, about 14 mm. wide; involucre

[9] Descr. New S. Amer. Pl. 152. 1920.

[10] Loc. cit. 153.

3-seriate, obgraduate, the outermost phyllaries ovate-lanceolate, about 2 cm. long, 5 to 6 mm. wide, with short narrow indurate base and spreading or reflexed attenuate herbaceous apex, pubescent like the leaves and ciliate; second series similar but shorter and broader, 11 to 13 mm. long, with indurate base and longer ovate herbaceous tip; third series oval, rounded or obtuse, 9 mm. long, 4 to 5 mm. wide, subchartaceous with submembranaceous tip, finely puberulous above and ciliate; rays yellow, probably about 8, neutral, the lamina oblong-oval, emarginate, 12 mm. long, 6 mm. wide, sparsely hispidulous on the nerves of the back; disk corollas yellow, glabrous except for the hispidulous teeth, 6 mm. long (the slender tube 1.5 mm. long); pales narrow, acutish, carinate, nearly glabrous, 7.5 mm. long; achenes oblong-obovoid, plump, lenticular in cross-section, narrowly margined on one side or marginless, 5 mm. long, 2.8 mm. wide, brownish-black, rather sparsely appressed-pilose, contracted above into a neck about 0.7 mm. long; pappus a crown of united unequal squamellae, about 0.5 mm. long.

Type in the herbarium of the New York Botanical Garden, collected in a loamy clearing at La Trinidad, Líbano, Department of Tolima, Colombia, altitude 1,100 to 1,400 meters, December 21 to 25, 1917, by F. W. Pennell (no.3229). Duplicate in the U. S. National Herbarium.

This species may be distinguished by the character of its pubescence and of its involucre.

Aspilia retroflexa Blake, sp. nov.

Herbaceous (?); stems (or branches?) 40 to 50 cm. long, slender, simple, densely and harshly tuberculate-strigose (the hairs above sometimes divergent or ascending); internodes 4.5 to 7.5 cm. long; leaves opposite; petioles slender, naked, 7 to 10 mm. long, densely tuberculate-strigose and tuberculate-hispid and hispidulous; leaf blades ovate or the lower lance-ovate, 6.5 to 10 cm. long, 2.5 to 3.5 cm. wide, falcate-acuminate, at base cuneate, obscurely serrulate (teeth about 10 or 12 pairs, depressed, 2 to 3 mm. apart), submembranaceous, above deep green, evenly but not densely ascending-hirsute with lepidote-tuberculate-based hairs, asperous, beneath scarcely paler green, evenly but not densely hispid-hirsute with ascending or subappressed hairs with scarcely tuberculate bases, triplinerved above the base, the chief veins mostly impressed above, prominulous beneath; peduncles terminal, solitary, monocephalous, pubescent like the upper part of stem, 7.5 cm. long; heads 3 cm. wide; disk 11 mm. high, 8 mm. thick; involucre 4-seriate, obgraduate, the phyllaries few, the two outermost series lanceolate or ovate-lanceolate, 8 to 14 mm. long, with appressed, indurate, densely strigose and strigillose base and much longer, reflexed or spreading herbaceous tip, this tuberculate-hispid, 1-nerved, obtuse, callous-apiculate, 3 to 4 mm. wide; the two inner series broadly oval, 8 to 9 mm. long, 5 mm. wide, broadly rounded, subappressed, with pale indurate base and subequal or shorter, herbaceous or submembranous (in the innermost narrowly scarious-margined) apex, densely strigillose and minutely tuberculate or the inmost subglabrous; rays apparently 6, neutral, golden-yellow with orange base (when dry), the lamina oblong-oval, bidentate, 16 mm. long, 6.5 mm. wide; disk corollas yellow, glabrous except for the teeth (these papillose-hispidulous on margin with several-celled hairs), 5.8 mm. long (tube 1.3 mm., throat slender-funnelform, 3.5 mm., teeth 1 mm.); pales spinulose-ciliolate toward the yellow apex, otherwise glabrous, acute, 6.5 mm. long; disk achenes (immature) ascending-pilose, 2.8 mm. long; pappus cyathiform, contracted at base, the ciliate squamellae somewhat unequal, 1 mm. long or less, without distinct awns.

Type in the U. S. National Herbarium, no. 1,059,673, collected in rich alluvial soil at Hacienda Álamos, 15 miles south of Gulf of Guayaquil, about 40 miles from Guayaquil, Ecuador, altitude 10 meters above tidewater, July 11, 1921, by W. W. Rowlee and George Mixter (no. 1239).

Apparently nearest *Aspilia eggersii* Hieron., also Ecuadorian, but distinguished by its reflexed outer phyllaries and considerably larger inner phyllaries.

Aspilia angusta Blake, nom. nov.

Aspilia angustifolia A. Gray in S. Wats. Proc. Amer. Acad. **22**: 425. 1887. Not *A. angustifolia* Oliver & Hiern in Oliver, Fl. Trop. Afr. **3**: 380. 1877.

The Mexican species named *Aspilia angustifolia* by Gray may be renamed *A. angusta*, Gray's name being preoccupied by a valid African species described by Oliver and Hiern.

Aspilia linearis Blake, nom. nov.

Aspilia linearifolia Baker in Mart. Fl. Bras. **6**[3]: 192. 1884. Not *A. linearifolia* Oliver & Hiern in Oliver, Fl. Trop. Afr. **3**: 380. 1877.

The name *Aspilia linearifolia*, applied by Baker to a Brazilian species, is preoccupied by a valid African species of the genus, described by Oliver and Hiern.

GYMNOLOMIA H. B. K.

Several years ago it was shown[11] that the name *Gymnolomia* H. B. K., which for many years had been used for a considerable group of species characterized by their epappose achenes, must be restricted to a group of about six species very closely related to *Aspilia*, and only remotely allied to most of the thirty-odd species which had been associated with them. At the same time the suggestion was made that further investigation might prove the genus to be identical with *Aspilia*. Subsequent study has shown that there are no characters of any consequence in habit, involucre, achenes, pappus, or floral features to distinguish *Gymnolomia* from the older genus *Aspilia* Thouars, and its species are accordingly here transferred to the latter genus.

Gymnolomia H. B. K.[12], as originally described, contained four species, *G. tenella* (*pl. 373*), *G. hondensis*, *G. triplinervia*, and *G. rudbeckioides* (*pl. 374*). The first species, *G. tenella*, which is to be taken as the type of the genus, is well figured in the plate cited, and is now represented by several collections made by Lehmann and Pittier in Colombia. The second species, represented in the Gray Herbarium by a photograph of the type, does not appear to be distinct from *G. tenella*. The third, *G. triplinervia*, is not known to have been re-collected since its discovery. The fourth, *G. rudbeckioides*, from Peru, has been recently collected by C. H. T. Townsend (no. A90) at Sabiango, Ecuador. His specimens in the National Herbarium, originally determined as this species by Dr. J. M. Greenman, agree very well with the original description and plate. They have a pappus of several short, free, subequal squamellae, without awns, and belong in fact to the genus *Hymenostephium*, to which the species is transferred on page 630 of this paper.

With the transfers here made, the only species of *Gymnolomia* unaccounted for are *G. kunthiana* (Gardn.) Baker and the scarcely known *G. connata* Spreng. It is not possible to place these species definitely until the types can be examined. The four species here transferred from *Gymnolomia* to *Aspilia* are the following.

Aspilia jelskii (Hieron.) Blake.

Gymnolomia jelskii Hieron. Bot. Jahrb. Engler **36**: 487. 1905.

Fragments from the type, *Jelski* 649, from Tambillo, Peru, are now in the National Herbarium.

Aspilia lanceolata Blake, nom. nov.

Gymnolomia hirsuta Klatt, Bot. Jahrb. Engler **8**: 42. 1887. Not *A. hirsuta* (Gardn.) Benth. & Hook.; Hook. & Jacks. Ind. Kew. **1**[1]: 216. 1893.

The type, *Lehmann* 360a from Tunguragua, Ecuador, is in the Gray Herbarium, and a photograph is in the National Herbarium.

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[11] Blake, Contr. Gray Herb. n. ser. **54**: 13. 1918.

[12] Nov. Gen. & Sp. **4**: 217. *pl. 373-4*. 1820.

Aspilia tenella (H. B. K.) Blake.

Gymnolomia tenella H. B. K. Nov. Gen. & Sp. **4**: 218. *pl. 373*. 1820.

Gymnolomia hondensis H. B. K. Nov. Gen. & Sp. **4**: 218. 1820.

This species is represented by *Lehmann* 1956, 2865, and 2994 (all in the Gray Herb.), and *Pittier* 650 (U. S. Nat. Herb.), all from the State of Cauca, Colombia. A photograph of the type of *G. hondensis* is in the Gray Herbarium. The two supposed species were originally described as somewhat doubtfully distinct, and the only differential characters listed were those of the leaves. In *G. tenella* these were described as ovate, acute, slightly cordate at base, and hispid-scabrous on both sides; in *G. hondensis* as ovate, subacuminate, rounded at base, and hispid-pilose. No further distinctions of any importance are brought out in the detailed descriptions of both plants or in the plate and photograph of the two species, and the specimens above listed, all certainly belonging to a single species, show that the leaves vary from broadly rounded to slightly cordate at base.

Aspilia triplinervia (H. B. K.) Blake.

Gymnolomia triplinervia H. B. K. Nov. Gen. & Sp. **4**: 219. 1820.

Type from the vicinity of Bogotá, Colombia. The species has not been recognized among recent collections. It appears to differ from *A. tenella* in its larger, appressed-hispidulous leaves, which are acute at base.

Viguiera apiculata Blake, sp. nov.

Erect, herbaceous, 1 meter high, branched toward the apex, the base not seen; stem slender, fuscous, subterete, hirsute-pilose with erectish to appressed few-celled whitish hairs with small tuberculate bases, glabrescent below; leaves alternate; blades narrowly linear-lanceolate or linear, 4 to 8.5 cm. long, 1.5 to 5 mm. wide, attenuate, acute at the subsessile base, weakly triplinerved above the base and sparsely feather-veined, hispid-pilose on both sides with antrorse whitish hairs with tuberculate bases and sparsely gland-dotted, dark green above, somewhat lighter green beneath; heads oblong-cylindric, 1 cm. wide, in small dense clusters of 6 to 12 at apex of stem and branches, on densely strigillose pedicels 2.5 mm. long or less; disk 5.5 to 7 mm. high, 3 mm. thick; involucre 4-seriate, strongly graduate, 4 to 5 mm. high, the outermost phyllaries broadly ovate, somewhat pointed, the inner oblong or oval, all indurate, whitish, nerved, with very small, abrupt, obtuse, appressed or somewhat spreading, herbaceous tips, rather sparsely hirsute-pilose and ciliate especially along margin and toward apex, a few subglandular hairs intermixed; rays 4 or 5, yellow, neutral, the lamina oval, 2 or 3-denticulate, 4-nerved, 3.3 mm. long, 2.5 mm. wide, hispid-pilose along the nerves on the back like the apex of the slender tube, this 2 mm. long, sessile-glandular; disk-flowers 8, the corollas yellowish, 4.2 to 4.5 mm. long, the slender tube 1.2 mm. long, glandular, the funnelform throat 1.8 mm. long, glabrous, the 5 teeth lance-ovate, papillose-ciliate, sparsely hispid dorsally at apex, 1.2 to 1.5 mm. long; pales lanceolate, hyaline, fimbriate, 3.5 mm. long; ray achenes inane, linear, glabrous, 3 mm. long. the pappus of a pair of lanceolate lacerate awns 0.5 mm. long and 1 or 2 similar squamellae half as long on each side between them; disk achenes (immature) oblong, 2 mm. long, glabrous, the pappus of 2 slender fimbriate-ciliate awns 1.3 to 1.5 mm. long and on each side between them about 3 deeply lacerate-fimbriate squamellae, united at base; anthers sagittate at base; style branches acute, shortly papillose-hispid on back.

Type in the U. S. National Herbarium, no. 385866, collected in clayey soil at La Tuveria, Michoacán or Guerrero, Mexico, altitude 850 meters, September 6, 1898, by E. Langlassé (no. 329).

Although the achenes are very immature, and the generic reference is therefore somewhat uncertain, I have little doubt that this species is a *Viguiera*. It goes readily in the section *Leighia*, where it is distinguished by the tiny crowded heads, and the phyllaries with minute abrupt herbaceous tips.

Helianthus grandiceps Blake, sp. nov.

"Shrub, 2.6 meters high;" stem stout, herbaceous and pithy above, terete, with few short sterile branches below the inflorescence, loosely spreading-pilose with mostly deciduous, several-celled, whitish hairs with small tuberculate bases, glabrescent; leaves (at least the upper) alternate; petioles densely hirsute-pilose with several-celled spreading hairs, 1 to 1.5 cm. long; upper leaf blades ovate, 5.5 to 10 cm. long, 2.5 to 5 cm. wide, acuminate, cuneate at base, crenate-serrate, thick-papery, above in youth densely and rather softly pilose with tuberculate-based hairs, at maturity densely and harshly tuberculate and somewhat hispidulous, beneath densely and softly pilose-tomentose with griseous (or in youth ochroleucous) flexuous hairs, triplinerved above the base, the smaller veins mostly concealed beneath by the tomentum; heads about 6, cymose-panicled, on monocephalous peduncles 2.5 to 14 cm. long, in flower 4.5 cm. wide, the disk at maturity 1.2 to 1.5 cm. high, 2 to 2.5 cm. thick; involucre 4-seriate, graduate, 1.6 to (fruit) 2 cm. high, the phyllaries oblong-lanceolate (outer) to ovate-oblong, acuminate, the outer herbaceous essentially throughout, 1-nerved, the inner with short indurate base and long herbaceous tip, 3-nerved, all rather densely pilose with suberect hairs and hirsute-pilose-ciliate, the tips loose, in age often reflexed or spreading; rays yellow, neutral, about 14, the lamina linear-elliptic, bidentate, about 10-nerved, 2.2 cm. long, 4 mm. wide, hispidulous on the veins beneath; disk corollas yellow with blackish teeth, sparsely hispidulous below and on teeth, 6 mm. long (tube 1 mm., throat 4.2 mm., teeth 0.8 mm.); pales obtuse or acutish, often minutely callous-apiculate, essentially glabrous, blackish-green at apex, 7 to 9 mm. long; ray achenes (sterile) with a pappus of about 10 ovate or oblong unequal squamellae 0.7 mm. long or less; disk achenes oblong, compressed, glabrous, 3.8 mm. long, their pappus of 1 narrowly lanceolate, paleaceous, caducous awn 2.5 mm. long, on the outer angle, and sometimes a squamella about half as long at its base; style tips hispidulous, obtuse.

Type in the U. S. National Herbarium, no. 1,021,898, collected in the vicinity of Huigra, mostly on the Hacienda de Licay, Ecuador, August 19, 1918, by J. N. Rose and G. Rose (no. 22231).

Helianthus grandiceps is nearest to *H. jelskii* and *H. lehmannii* Hieron., both of which are now represented by fragments in the National Herbarium. The former differs in its triangular-ovate, cordate-based leaves, which are ochroleucous-lanate-tomentose beneath, and the latter in its smaller heads and fewer narrower phyllaries, which are densely long-pilose with subsericeous hairs on their exposed surface.

Helianthus subniveus Blake, nom. nov.

Helianthus niveus Hieron. Bot. Jahrb. Engler **21**: 350. 1895. Not *H. niveus* T. S Brandeg. Proc. Calif. Acad. II. **2**: 173. 1889.

The Peruvian plant named *Helianthus niveus* by Hieronymus in 1895, fragments of whose type are now in the National Herbarium, is a very distinct species, but its name must be changed because of the fact that a species of the Sonoran region of western North America, *Helianthus niveus* (Benth.) T. S. Brandeg., already bears the same name.

Perymenium simulans Blake, sp. nov.

Root woody, tuberous-thickened, 1.5 to 2 cm. in diameter; stems numerous, curved-ascending from a decumbent base, 15 to 30 cm. long, herbaceous, slender, branched, greenish, striate, sparsely strigose; leaves remote, 3 to 6 pairs, opposite, the middle and upper ones much the larger; petioles hispid, 1 to 3 mm. long; blades ovate, 2.5 to 5 cm. long, 1.8 to 2.3 cm. wide, acute, rounded to cuneate-rounded at base, serrate with about 8 pairs of usually emucronulate teeth, firm, triplinerved, reticulate beneath, green both sides, above evenly but not densely scabrous-strigose and strigillose with lepidote-based hairs, beneath hispid and hispidulous with ascending hairs, these longer along the veins; lower leaves and those of the sterile branches

much smaller, ovate or oval, 1 to 1.8 cm. long; heads 3 to 4.5 cm. wide, solitary, terminal, on strigose peduncles 6 to 12.5 cm. long; disk 10 mm. high, 9 to 12 mm. thick; involucre 2-seriate, equal or with the outer phyllaries slightly longer, 9 to 10 mm. high, the phyllaries elliptic-oblong, acutish, rather sparsely strigose and hispid-ciliate, with short pale scarcely ribbed base and much longer, herbaceous, loosely spreading tip; rays 8, fertile, golden-yellow, the lamina oval-oblong, 1.8 to 2 cm. long, 6 to 8 mm. wide; disk corollas yellow, papillose on teeth, 6 mm. long (tube 1.5 mm.); pales acuminate, hispidulous except on sides, 8.5 mm. long; disk achenes (immature) hispid especially on angles and apex; pappus awns about 20, fragile, unequal, the 2 on the angles 2.2 to 4 mm. long, the others 0.5 to 1.5 mm. long.

Type in the U. S. National Herbarium, no. 571433, collected at Otinapa, Durango, Mexico, July 25 to August 5, 1906, by Edward Palmer (no. 408).

ADDITIONAL SPECIMEN EXAMINED:

DURANGO: Without definite locality, altitude 1,000 meters, *García* 340.

Perymenium simulans differs from *P. tenellum* A. Gray, under which name the type was distributed, in its much larger heads and leaves and longer involucre, as well as in its strigose stems. It is more closely related to *P. flexuosum* Greenm., but may be distinguished by its larger rays and involucre, and especially by its well-developed pappus.

Perymenium subcordatum Blake, sp. nov.

Shrub with flexuous branches; stem and branches strigose and strigillose, in age glabrate, grayish; leaves opposite; petioles slender, strigose, 2 to 3 mm. long; blades ovate, 1.5 to 3 cm. long, 9 to 17 mm. wide, acute, at base slightly cordate to broadly rounded, serrulate with 4 to 7 pairs of depressed mucronulate teeth, triplinerved and prominulous-reticulate beneath, pergamentaceous, above scabrously strigose and strigillose with slightly tuberculate-based hairs, beneath scarcely paler green, strigose along the chief veins, rather sparsely strigillose along the veinlets and on surface, the hairs slightly divergent; heads 3 or 4 toward tips of branches, axillary and terminal; peduncles monocephalous, strigose, 1.5 to 6.5 cm. long; disk hemispheric, 5 to 6 mm. high, 5 to 7 mm. thick; involucre of few appressed phyllaries, 3 to 4-seriate, strongly graduate, the outermost series of phyllaries ovate, obtuse, strigillose, indurate, with short subherbaceous tip, the next series similar but oval, rounded, strigillose and short-ciliate, the inner similar, oblong-elliptic, obtuse, with obscurely subherbaceous tip; corollas not seen; pales slender, strigillose on keel and toward the yellowish apex, 6 mm. long; ray achenes trigonous, wingless, blackish-brown, cross-wrinkled, puberulous toward the truncate apex, 2.2 mm. long; disk achenes similar, biconvex, 2.8 mm. long; pappus of about 12 very unequal slender deciduous awns, those toward the angles much the longest, about 1 mm. long.

Type in the U. S. National Herbarium, no. 566198, collected on mountains, Tlapancingo, Oaxaca, Mexico, altitude 1,830 to 2,440 meters, December 7, 1894, by E. W. Nelson (no. 2067). Duplicate in the Gray Herbarium.

Perymentium subcordatum is related to *P cervantesii* DC. and *P. jaliscense* Robins. & Greenm. From the latter it differs in the form of its leaves and its much shorter pappus; from the former in the shape of its leaves and in its narrower, obscurely herbaceous-tipped inner phyllaries.

Perymenium oxycarphum Blake, sp. nov.

Stems tufted, herbaceous, 50 cm. high, slender, quadrangular, strigillose, greenish, simple below the inflorescence; leaves opposite, few, about 6 pairs; petioles strigose, 6 to 7 mm. long; blades of the middle leaves ovate to oblong-ovate, 4 to 4.5 cm. long, 2 to 2.3 cm. wide, acute, rounded or cuneate-rounded at base, papyraceous, crenate-serrate with 7 to 8 pairs of depressed mucronulate teeth, triplinerved and loosely prominulous-reticulate beneath, above dull green, evenly scabrous-strigose and strigillose with tuberculate-based hairs, beneath green, rather sparsely strigose and strig-

illose chiefly along the veins and veinlets, the hairs longer along the chief veins; upper and lower leaves smaller; peduncle 11 cm. long, 4-headed; pedicels 2.5 to 11 cm. long, striate, strigillose, that of the terminal head only 6 mm. long; heads 4 cm. wide; disk subglobose, 7 to 9 mm. high, and thick; involucre 3-seriate, graduate, 6 to 6.5 mm high, the phyllaries ovate, acute, strigillose and ciliate, with pale indurate base and short, loose, herbaceous, callous-unguiculate apex; rays 8, fertile, yellow, apparently darker at base, the lamina elliptic, bidenticulate, 17 mm. long, 6 mm. wide; disk corollas yellow, papillose-hispidulous on teeth, 5 mm. long (tube 1.2 mm.); pales narrow, stiffly acuminate, narrowly keeled, hispidulous above, yellowish, 6 mm. long; disk achenes thickened, blackish, hispidulous above, 2.5 mm. long; pappus awns about 10, unequal, deciduous, 3 mm. long or less.

Type in the U. S. National Herbarium, no. 385887, collected in clayey soil, Real de Guadelupe, Michoacán or Guerrero, Mexico, altitude 1,300 meters, September 15, 1898, by E. Langlassé (no. 354).

Perymenium oxycarphum is most closely related to *P. cornutum* T. S. Brandeg., but may be easily distinguished by its strongly indurate-based, merely strigillose phyllaries, and by the sparser appressed pubescence of its nonrugose leaves.

Perymenium lancifolium Blake, sp. nov.

Shrubby; stem slender, 4-sulcate, strigillose, branched; leaves opposite; petioles slender, narrowly margined above, strigillose, 6 to 10 mm. long; blades lanceolate, those of the main stem 6 to 10 cm. long, 1 to 2 cm. wide, long-acuminate, somewhat falcate, at base acutely cuneate and narrowly decurrent on the upper part of the petiole, firm-papery, remotely serrulate (teeth low, 6 to 15 pairs), above deep dull green, harshly and sparsely short-strigose, beneath much lighter green, antrorse-hispidulous along the veins and veinlets, gland-dotted between them, triplinerved above the base and prominulous-reticulate beneath, impressed-veined above; heads about 1.8 cm. wide, in ternately divided cymes or cymose panicles of 3 to 12 at tips of stem and branches, the pedicels naked, 5 to 28 mm. (usually about 18 mm.) long; disk subglobose, 4 to 5 mm. high, 5 to 6 mm. thick; involucre 4 to 5-seriate, graduate, 5 to 6 mm. high, the outermost phyllaries small, broadly ovate, acute, appressed, indurate, minutely strigillose and obscurely ciliolate, the middle ones oval, broadly rounded, appressed, ciliolate, the innermost longer, oval, their tips loose, subscarious, broadly rounded, minutely ciliolate, dorsally subglabrous, yellowish (?); rays about 7, fertile, the lamina oblong-elliptic, yellow, darker toward base (at least when dry), 9 mm. long, 2.8 mm. wide; disk corollas yellow, minutely hispidulous toward apex of tube, 3.5 mm. long (tube slender, 1.3 mm., throat funnelform-campanulate, 1.5 mm., teeth deltoid-ovate, 0.7 mm.); pales acute, carinate, spinulose-ciliolate on keel, dentate on margin above, yellowish toward tip, 3.3 mm. long; achenes of ray trigonous, oblong, 2.2 mm. long, blackish brown, finely cross-wrinkled, hispidulous, wingless but with a minute tooth at apex of each angle, their pappus of about 25 slender, hispidulous, unequal, fragile awns 1.5 mm. long or less, that on the inner angle the longest; disk achenes oblong, lenticular in cross section, hispidulous, wingless, 2.5 mm long, their pappus of about 15 unequal awns, the two longest 1.5 mm. long or less, the others 0.4 to 0.8 mm. long.

Type in the U. S. National Herbarium, no. 1,012,467, collected at Batel, Concordia, Sinaloa, Mexico, altitude 1,600 meters, September, 1919, by M. P. Dehesa (no. 1621).

Perhaps nearest *Perymenium gracile* Hemsl., known to the writer only from description, and said to have ovate-lanceolate leaves and smaller heads.

Perymenium rotundisquamum Blake, sp. nov.

Stems tufted, woody only at base if at all, 40 cm. high or more, slender, quadrangular with rounded angles, strigillose, greenish, simple below the inflorescence; leaves opposite, shorter than the internodes; petioles strigose, naked, 5 to 7 mm. long; blades oblong to oblong-lanceolate, 3 to 4.8 cm. long, 1 to 1.5 cm. wide, acute,

at base cuneate, serrulate with about 20 pairs of depressed mucronulate teeth, triplinerved above the base, prominulous-reticulate beneath, above deep green, evenly but not densely scabrous-strigillose and densely glandular-tuberculate, beneath pale but not canescent, strigillose along veins and veinlets and more finely so between them; peduncles terminal and from the upper axils, slender, strigillose, 3 to 4-headed, 2 to 6.5 cm. long; pedicels 5 to 23 mm. long; heads 1.5 to 1.8 cm. wide; disk subglobose, 5 mm. high, 6 mm. wide; involucre 4-seriate, graduate, 4 to 4.5 mm. high, the phyllaries orbicular-ovate (outer) to suborbicular, obtuse (outer) to broadly rounded, appressed, subindurate without herbaceous apex, strigillose and ciliolate, vittate; rays 9, fertile, the lamina oval, yellow, apparently darker at base, 7 mm. long, 3.5 mm. wide; disk corollas (immature) yellow, glabrous, papillose on teeth, 3 mm. long (tube 0.7 mm.); pales obtuse, carinate, strigillose above and on keel, 4 mm. long; disk achenes (very immature) strigillose above; pappus awns about 10, those on the angles 2 mm. long, the others about 0.6 mm. long.

Type in the U. S. National Herbarium, no. 385895, collected in clayey soil at Vallecito, Michoacán or Guerrero, Mexico, altitude 950 meters, September 18, 1898, by E. Langlassé (no. 363).

Related to *P. goldmanii* Greenm., from which it differs in its very round-tipped phyllaries and more oblong leaves with entirely appressed pubescence, and to *P. purpusii* T. S. Brandeg., from which it differs in its involucre and in its smaller, serrulate, shorter-petioled leaves.

Perymenium nicaraguense Blake, sp. nov.

Shrub, branched above; stem rather slender, rounded-quadrangular, 4-sulcate, strigillose; leaves opposite; petioles slender, 1 to 2 cm. long, strigillose; blades elliptic-lanceolate, those of the main stem 6 to 10.5 cm. long, 1.3 to 3 cm. wide, acuminate, slightly falcate, cuneate at base, remotely serrulate, pergamentaceous, above dull green, sparsely and somewhat harshly strigillose, beneath pale, antrorse-hispidulous along the veins and minutely so along the finer veinlets, featherveined or indistinctly triplinerved well above the base, the lateral veins 6 or 7 pairs, prominulous beneath and with the secondaries loosely reticulate; heads about 1.5 cm. wide, in ternately divided cymose panicles of 5 to about 23 at tips of stem and branches, the pedicels strigillose, mostly 5 to 9 mm. long; disk 3 to 5 mm. thick, in flower 8 mm. high, in fruit about 6 mm.; involucre about 4-seriate, graduate, 4 to 5 mm. high, the phyllaries acute (outer) to (innermost) acutish or obtuse, ovate (outermost) to oblong-oval, with indurate base and obscurely subherbaceous apex, appressed, minutely strigillose and rather obscurely ciliolate; rays 6, yellow, fertile, the lamina oval, about 6 mm. long, 2.5 mm. wide; disk corollas yellow, about 4.5 mm. long (tube 1.2 to 1.6 mm., throat 2.5 mm., teeth 0.7 mm.); pales acute or obtuse, slightly toothed laterally, with ciliolate keel, about 5 mm. long; ray achenes trigonous, cuneate-oblong in outline, blackish, cross-wrinkled, hispidulous at apex and on the angles, narrowly winged above, the wings produced into teeth 0.7 mm. long or less, the pappus of about 14 slender, hispidulous, unequal, fragile awns, the longest 1.5 mm. long; disk achenes cuneate-oblong, compressed, hispidulous at apex and on margin, 3.2 mm. long, produced at apex into 2 teeth about 0.7 mm. long, the pappus of about 15 unequal fragile awns, the longest 2 mm. long.

Type in the U. S. National Herbarium, no. 988985, collected in pine woods at San Rafael del Norte, Nicaragua, altitude 1,200 to 1,350 meters, March 25 or 26, 1917, by W. de W. Miller and Ludlow Griscom (no. 44). Additional specimens, with the same data, collected under nos. 45 and 76.

Related to *P. purpusii* T. S. Brandeg., of Guatemala and Chiapas, but with much shorter pedicels and proportionately narrower leaves, which are distinctly pale beneath. Of interest as the first species of the genus to be found in the region between El Salvador and Colombia.

Perymenium chihuahuense Blake, sp. nov.

Shrub with simple branches; stem and branches slender, strigose and strigillose, sulcate, purplish becoming brownish; leaves opposite, reflexed; petioles strigose; 1 mm. long; blades lance-ovate, 2 to 3 cm. long, 7 to 10 mm. wide, acuminate, at base rounded, serrate, usually more or less folded and with plicate-crisped margins, triplinerved and somewhat prominulous-reticulate beneath, above light green, evenly scabrous-strigose, beneath not paler, evenly but not densely short-strigose; heads about 8 mm. wide, in terminal clusters of 3 to 5; pedicels strigose, usually 6 to 12 mm. long, sometimes up to 3.5 cm., subtended by reduced bract-like leaves; disk subhemispheric, 7 to 8 mm. high, 4 to 6 mm. thick; involucre 4 to 5-seriate, graduate, 4 to 5 mm. high, appressed, densely cinereous-strigillose and ciliate, the outermost phyllaries ovate, acutish, the inner oval-ovate, obtuse, 3-nerved, all pale and indurate, with very obscure subherbaceous tips; rays about 8, pistillate, yellow, the lamina elliptic, 2.5 mm. long; disk corollas yellow, essentially glabrous, 4 mm. long (tube 1 mm.); pales acute, strigillose above, yellow-tinged, 6 mm. long; ray achenes not seen; disk achenes biconvex, strigillose, wingless, 3 mm. long; pappus of about 12 very unequal slender caducous awns 1.8 mm. long or less.

Type in the U. S. National Herbarium, no. 41957, collected on rocky hills near Chihuahua City, Chihuahua, Mexico, May 25, 1885, by C. G. Pringle (no. 152).

The type collection of this species was doubtfully included in *Perymenium rude* by Robinson & Greenman[13] in their revision of the genus. In restricting the name *P. rude*, I select as type the first listed specimen, *Pringle* 4803 in the Gray Herbarium, from Las Sedas, Oaxaca. The specimen of this number in the U. S. National Herbarium may represent a distinct species, having the leaves densely cinereous-hispidulous beneath, while they are distinctly green beneath and much less densely pubescent in the type sheet in the Gray Herbarium. *Nelson* 954, cited in the original description of *P. rude*, agrees in these features with the specimen in the Gray Herbarium, while *C. L. Smith* 616 (not cited) agrees perfectly with the sheet of *Pringle* 4803 in the National Herbarium.

From *P. rude*, as thus restricted, *P. chihuahuense* is distinguished by its narrower, lance-ovate, reflexed and crisped leaves, and its densely cinereous-strigillose phyllaries with nearly obsolete herbaceous tips. It is more closely allied to *P. parvifolium* A. Gray, but differs in the obsolete herbaceous tips of the phyllaries and the less evident peduncle. *P. chihuahuense* is of interest as the most northern representative of the genus.

Perymenium lasiolepis Blake, sp. nov.

Frutescent, branching; stem slender, brown, striatulate, lenticellate, glabrescent; branches erectish, striate, fuscous, densely hispidulous or short-hispid-pilose with spreading or slightly reflexed hairs; leaves opposite, rarely alternate on the branches; petioles hispidulous and hispid-pilose, 2 to 5 mm. long; blades rhombic-ovate, 2 to 3.3 cm. long, 1 to 1.8 cm. wide, broadest near the base, acutish, cuneate or rounded-cuneate at base, serrate with 8 to 11 pairs of teeth, firm, triplinerved, impressed-veined above, finely reticulate beneath, above dull green, densely and somewhat harshly hispid-pilose with spreading tuberculate-based hairs, beneath very densely and rather softly canescent-pilose with spreading hairs, along the veins hispid-pilose; heads about 1.3 cm. wide, in panicles of 4 to 9 terminating stem and branches; pedicels densely ascending-hispid-pilose, 6 to 23 mm. long; disk hemispheric, 6 to 8 mm. high and thick; involucre 3-seriate, graduate, 6 to 7 mm. high, the phyllaries lance-ovate, acuminate to an acute or acutish apex, densely and subcanescently hispid-pilose and ciliate, subindurate and pale at base, with equal or longer, loosely spreading, herbaceous tip; rays about 8, pistillate, yellow, the lamina oval, 5 mm. long; disk corollas yellow, puberulous on teeth, 4.5 mm. long (tube 1.5 mm.); pales acuminate, thin, narrowly carinate, hispidulous above, 4.5 mm. long; disk achenes biconvex,

[13] Proc. Amer. Acad. **34**: 527. 1899.

papillose, blackish, hispidulous on angles and above, 2 mm. long; pappus-awns about 12, fragile, one 2.5 mm. long, the others 1 to 1.5 mm. long.

Type in the U. S. National Herbarium, no. 841412, collected at San Simón, Puebla, Mexico, September, 1909, by C. A. Purpus (no. 4138).

The type collection of this species was distributed as *P. asperifolium* Schultz Bip. Its nearest relative, however, is *P. blepharolepis* Blake, from which it is distinguished by its densely hispid-pilose phyllaries and its densely canescent-pilose lower leaf-surface.

Perymenium consobrinum Blake, sp. nov.

Frutescent, branching; stem slender, subterete, purplish-brown, glabrate; branches fuscous, striatulate, densely and cinereously hispidulous and hispid-pilose with short reflexed hairs; leaves opposite, rarely alternate on the branches; petioles hispidulous and hispid-pilose, margined above, 3 to 6 mm. long; blades ovate to lance-ovate, 2.5 to 4 cm. long, 1.2 to 2 cm. wide, acutish, cuneate at base, firm, crenate-serrate with about 5 pairs of obtuse teeth, triplinerved with the veins impressed on the upper surface, above deep green, rugose, densely hispid-pilose with short spreading tuberculate-based hairs, beneath glaucous-cinereous, very densely hispid-pilose with spreading slightly harsh hairs; heads 1.8 cm. wide, in terminal umbellate clusters of 5, and on 1 to 3-headed peduncles 3.8 to 5 cm. long from the upper axils; pedicels 1 to 2.8 cm. long, densely hispid-pilose with short spreading-ascending hairs; disk hemispheric, 6 to 8 mm. high, 7 to 8 mm. thick; involucre 3 to 4-seriate, graduate, 6 mm. high, the phyllaries ovate, narrowed to apex but distinctly obtuse, ribbed, strigose and short-ciliate, with pale subindurate base and equal or longer, loosely spreading, herbaceous tips; rays about 8, pistillate, yellow, the lamina oval, 9 mm. long; disk corollas yellow, hispidulous on teeth, 5 mm. long (tube 1.6 mm.); pales acute, thin, ciliolate on back and above, 6 mm. long; disk achenes (immature) somewhat hispidulous; pappus awns about 12, very unequal, one 2.5 to 3 mm. long, the others 0.5 to 1.5 mm. long.

Type in the U. S. National Herbarium, no 840782, collected at Los Naranjos, Oaxaca, Mexico, July, 1908, by C. A. Purpus (no. 3097).

This species, the type collection of which was distributed as "*Zaluzania*," is distinguished from its near ally, *P. hypoleucum* Blake, by its longer involucre and pedicels, and by the denser pubescence of the lower leaf-surface.

Perymenium latisquamum Blake, sp. nov.

Branching, probably frutescent; stem and branches stoutish, pale greenish, striate, strigillose with strongly tuberculate-based hairs; leaves opposite; petioles tuberculate-strigose, gland-dotted, naked, 8 to 15 mm. long; blades ovate to (upper) lance-ovate, 6 to 12 cm. long, 2.2 to 7.5 cm. wide, acuminate, cuneate to rounded-cuneate at base, crenate-serrate with 16 to 30 pairs of mucronulate teeth, firm, triplinerved and prominulous-reticulate beneath, above dull green, harshly tuberculate-hispidulous with curved ascending hairs, beneath paler green, evenly but not densely spreading-hispid-pilose and gland-dotted, the hairs along the veins stouter and incurved; heads numerous, 2.5 cm. wide; pedicels 1.5 to 5 cm. long, striate, strigose; disk hemispheric, 8 to 11 mm. high and thick; involucre 4-seriate, graduate, 8 to 9 mm. high, the phyllaries suborbicular (outer) to rotund-oval, obtuse (outer) to broadly rounded, vittate, the outer strigillose and sparsely ciliate, appressed, with short obscure dark tips, the inner finely strigillose, indurate and pale below, the tip shorter, erose, sparsely ciliate, otherwise nearly glabrous, loosely spreading, submembranous; rays 12, pistillate, yellow, the lamina oval, 1 cm. long; disk corollas yellow, papillose on teeth, 4.8 to 6 mm. long (tube 1.3 to 2 mm.); palee acute to acuminate, spinulose on keel, 6 mm. long; disk achenes biconvex, blackish, papillose, hispidulous on margin and apex, 3.5 mm. long; pappus awns about 15, fragile, unequal, the 2 on the angles 2.5 to 3.8 mm. long, the others 1.5 mm. long.

Type in the Gray Herbarium, collected on the Sierra de Tonalá, Chiapas. Mexico, September, 1913, by C. A. Purpus (no. 6647). Photograph and fragments in the U. S. National Herbarium.

Related to *P. strigillosum* (Robins. & Greenm.,) Greenm., as which it was distributed, but readily distinguishable by its very different involucre.

Perymenium acuminatum (Llave) Blake.

Oteiza acuminata Llave, Reg. Trim. **1** : 41. 1832.

Calea elegans DC. Prodr. **5** : 674. 1836.

This species has the pappus of *Perymenium*, of numerous, hispidulous, caducous, setiform aristae, and must be referred to that genus. It is known from San Luis Potosi (*Parry & Palmer* 491, *Schaffner* 237/679), and State of Mexico (*Pringle* 4297). Pringle's plant has closely aggregated heads and may be distinguishable from the San Luis Potosi form, but more material is needed. The closest relative of *P. acuminatum* is probably *Perymenium ruacophilum* Donn. Smith.,[14] of which *Calea insignis* Blake[15] is a synonym.

The description of *Oteiza acuminata* Llave, for a copy of which I am indebted to Dr. J. H. Barnhart, agrees well with material of *Calea elegans*, and there seems to be no season why the earlier specific name should not be adopted. The name *Oteiza* Llave is referred to *Calea elegans* DC. without hesitation by Bentham and Hooker,[16] "fide speciminum Mexicanorum ex herb. Mairetiano."

Steiractinia rusbyana Blake, sp. nov.

Frutescent, 1 to 1.3 meters high; stem and branches stout, 4 to 6 mm. thick, terete, dull grayish brown, densely lanate-pilose with dull loosely spreading hairs, in age glabrate; leaves opposite; petioles stout, naked, densely lanate-pilose, 1.5 to 2.2 cm. long; blades ovate-lanceolate, 6 to 10 cm. long, 2 to 4 cm. wide, tapering from near the base to the somewhat falcate tip, at base cuneate-rounded, serrulate (teeth about 30 pairs, subappressed), triplinerved and reticulate beneath, thick-pergamentaceous, above dull green, densely and rather softly incurved-pilose and in youth rufescent-subsericeous, beneath densely lanate-pilose with somewhat rufescent hairs, in youth subsericeous; heads about 4.5 cm. wide, about 4 at ends of branches, axillary and terminal; pedicels densely lanate-pilose, 1 to 3.5 cm. long; disk hemispheric, 1 to 1.3 cm. high, 1.8 to 2.3 cm. thick; involucre 3 to 4-seriate, somewhat graduate, 12 mm. high, the outermost phyllaries about 4, broadly ovate, acute or acutish, with short indurate base and herbaceous spreading tip, densely tuberculate-pilose and puberulous, 3 to 6 mm. wide; the next series similar; the one or two innermost series broadly obovate-oblong, subglabrous, with rounded and ampliate, erose-ciliate, membranaceous tip; involucre sometimes subtended by 2 or 3 small lance-elliptic bracts; rays about 10, neutral, the lamina elliptic-oblong, bifid, yellowish, 1.8 cm. long; disk corollas pale yellow, glabrous, with papillose-margined teeth, 6 mm. long (tube 1.8 mm.); pales acute, spinulose-ciliate above, 8 mm. long, strongly wing-keeled, the keel spinulose, abruptly terminating and forming a tooth below apex of pale; ray achenes inane, trigonous, sparsely spinulose-ciliolate, 2.5 mm. long; pappus of abou 22 very unequal slender spinulose awns, 1.5 mm. long or less; disk achenes biconvex, blackish, narrowly 2-winged, glabrous except for the spinulose-ciliate wings 4 mm. long; pappus of about 30 slender spinulose caducous awns 1.8 to 3 mm. long.

Type in the herbarium of the New York Botanical Garden, collected on the open top of the San Lorenzo Ridge, near Santa Marta, Colombia, altitude about 2,200 meters, January 25 and February 26, 1898–99, by Herbert H. Smith (no. 1342). Photograph and fragments in the U. S. National Herbarium.

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[14] Bot. Gaz. **55** : 437. 1913.

[15] Contr. Gray Herb. n. ser. **52** : 56. 1917.

[16] Benth. & Hook. Gen. Pl. **2** : 391. 1873.

Steiractinia rusbyana is related to *S. mollis* Blake and *S. ocanensis* Blake. From the former it is easily distinguished by its longer petioles and strongly alate-carinate pales, from the latter by its glabrate branches, soft pubescence, and shorter involucre. Smith's label states that the species is rare.

Steiractinia longipes Blake, sp. nov.

"Tall herb;" stem terete, fuscous-brown, densely strigose-pilose with dull white hairs with slightly tuberculate bases, glabrescent below, oppositely branched; leaves opposite; petioles densely strigose-pilose and hispid-pilose-ciliate, sulcate, 12 to 16 mm. long; blades ovate, 6.5 to 10.5 cm. long, 3 to 5.2 cm. wide, acuminate, at base cuneate, papyraceous, triplinerved about 1 cm. above the base and somewhat venose below, serrulate with about 8 pairs of minute teeth near the middle, above dull green, evenly tuberculate-hispid-pilose with incurved hairs, beneath densely and rather softly incurved-pilose with sordid-white somewhat shining hairs, these longer and somewhat coarser along the veins; peduncles 3 to 6 at tips of branches, pubescent like the stem, 6 to 10 cm. long, bearing 1 or 2 heads, naked or 1-bracteate; heads about 5.3 cm. wide; disk hemispheric, 1.3 cm. high, 1.5 cm. wide in flower, 2.2 cm. in fruit; involucre about 3-seriate, the outermost phyllaries 4 or 5, 10 to 14 mm. long, 2.5 to 7 mm. wide, with short, contracted, indurate, glabrescent base and ovate or oval-ovate, obtuse, spreading or reflexed herbaceous tip, this tuberculate-strigose, strigillose, and ciliate; two inner series thinner, oval, with somewhat indurate glabrescent base, the tip longer, submembranous, rounded, erose, sparsely strigillose, at length loose; rays about 10, neutral, yellow, the lamina oval, emarginate, 2.2 cm. long, 8 mm. wide, sparsely hispidulous on the dorsal nerves; disk corollas yellow, glabrous except for the papillose-margined teeth, 7.5 mm. long (tube 2 mm.); pales narrow, essentially glabrous, 9 mm. long, with contracted spinulose-denticulate tip; achenes obovate-oblong, 4.3 mm. long, 2.5 mm. wide, somewhat thickened, narrowly 2-winged nearly to apex, mottled, sparsely pubescent above, with truncate saucer-shaped apex; pappus caducous, of about 30 upwardly hispidulous very slender awns 5 mm. long or less.

Type in the herbarium of the New York Botanical Garden, collected in open loam between Fusagasuga and Pandi, Department of Cundinamarca, Colombia, altitude 1,000 to 1,300 meters, November 30, 1917, by F. W. Pennell (no. 2748). Duplicate in the U. S. National Herbarium.

Related to *Steiractinia oyedaeoides* Blake, which has peduncles only 2.2 to 4.2 cm. long, smaller heads, 1-winged achene, and much shorter pappus.

The inflorescence in this species consists at first of three heads, one terminating the branch or stem, the others solitary in the axils of the two reduced leaves which are borne at the last node. Later a second or sometimes even a third peduncle develops in the axil between each leaf and its primary peduncle, in the same vertical plane, either free or adnate for 2 or 3 mm. at base to the older peduncle.

Melanthera oxycarpha Blake, sp. nov.

Herbaceous, 0.5 meter high and more, the base not seen; stem slender, purple-maculate, sparsely strigose, oppositely branched; internodes 5 to 17 cm. long; leaves opposite; petioles slender, nearly naked, sparsely strigose and short-hirsute, 6 to 13 mm. long; leaf blades linear-lanceolate, 3.5 to 7.5 cm. long, usually with a single short erect lobe at base on each side and there 8 to 12 mm. wide, above the lobes 6 to 10 mm. wide, acuminate, dentate-serrate or serrulate throughout above the entire cuneate base (teeth 20 to 25 pairs), papery, above deep green, densely tuberculate, evenly but sparsely hirsute with somewhat incurved hairs, beneath scarcely paler green, evenly but not densely hirsute especially along the veins, triplinerved above the base, the veins obscure or impressed above, prominulous beneath, the secondaries few; heads solitary in the forks and in 2's or 3's at tips of branches, discoid, subglobose, in fruit (corollas fallen) 6 to 8 mm. high, 9 to 11 mm. thick, on strigose monocephalous peduncles 2 to 9.5 cm. long; involucre 2 or 3-seriate, scarcely

graduate, 4 to 5 mm. high, the phyllaries lance-ovate, acuminate, densely strigose, with pale subindurate base and subequal, appressed or erect, herbaceous tips; disk corollas white, finely hispidulous toward apex, 4.2 to 4.5 mm. long (tube 0.8 mm., throat about 2.8 mm., teeth 0.8 mm.); pales obovate-oblong, 5 to 5.5 mm. long, abruptly cuspidate-acuminate (the point erect or slightly recurved, 1.2 mm. long), spinulose-hispidulous on keel and on margin toward apex; achenes thick-quadrangular, 2.2 mm. long, glabrous except for an hispidulous ring around the truncate apex; awns about 4, deciduous, unequal, slender, 2 mm. long or less; squamellae few, short, inconspicuous.

Type in the U. S. National Herbarium, no. 841743, collected in fields at Zacuapan, Veracruz, Mexico, May, 1907, by C. A. Purpus (no. 2437).

The type collection was distributed as *Melanthera lanceolata* Benth., but in that species the pales are merely acute. The species finds its nearest relative in *M. microphylla* Steetz of Panama, in which, according to the description, the stems are numerous, filiform, and procumbent, the leaves are linear, strigose, and much smaller, and the heads are smaller.

Melanthera purpurascens Blake, sp. nov.

Stem about 0.5 meter long (or more?), oppositely branched, perhaps suffrutescent and procumbent, slender, rounded-quadrangular, grooved, evenly but not densely strigillose; internodes mostly 4 to 8 cm. long; leaves opposite; petioles strigillose or hispidulous, 4 to 15 mm. long; leaf blades linear-oblanceolate to oblong-elliptic, 2.7 to 4.5 cm. long, 3 to 17 mm. wide, acute, at base cuneate, serrulate or serrate with 5 to 17 pairs of teeth (a pair near base sometimes noticeably larger than the others), thick-papery, above deep green, densely tuberculate-hispidulous and more sparsely tuberculate-hispid with ascending hairs, beneath scarcely paler green, along the venation rather densely short-hispid with antrorse or divergent hairs, on the surface evenly but not densely tuberculate-hispidulous, triplinerved above the base, the veins impressed above, loosely prominulous-reticulate beneath; peduncles 1 or 2 at tips of branches, monocephalous, 3 to 10 cm. long; heads depressed-subglobose, in fruit 5 mm. high, 9 to 10 mm. thick; involucre 2-seriate, scarcely graduate, 3.5 to 4 mm. high, the phyllaries ovate, acute or short-acuminate, callous-tipped, appressed, with pale indurate base and subequal greenish apex, densely strigillose, on margin distinctly short-hispid-ciliate; corollas not seen; pales 4 to 5 mm. long, purplish above, hispidulous dorsally, tuberculate toward apex, the outer with abrupt stiff callous-pointed tips 0.5 to 0.8 mm. long, the inner rather gradually acuminate, with callous tips; achenes thick-quadrangular, 2 mm. long, glabrous except at the truncate minutely hispidulous apex; awns deciduous, about 1.8 mm. long, slender; squamellae none.

Type in the U. S. National, Herbarium, no. 234001, collected on tableland about Ocuilapa, Chiapas, Mexico, altitude 1,035 to 1,155 meters, August 21, 1895, by E. W. Nelson (no. 2995).

Related to *Melanthera lanceolata* Benth., but distinguished by its strongly hispidulous-ciliate phyllaries and smaller heads with distinctly acuminate inner pales.

Flourensia hirtissima Blake, sp. nov. PLATE 59.

Undershrub, about 20 cm. high, much branched, very leafy, the branches ascending; younger branchlets brown, pilose-hirsute, the older gray-barked, glabrate; leaves alternate, narrowly linear-lanceolate or linear-oblanceolate, 1.8 to 4.8 cm. long (including the petioliform base), 1.8 to 4 mm. wide, acuminate at apex, long-acuminate to the petioliform narrowly margined base, entire, coriaceous, nearly equally green on both sides, densely hirtous-ciliate with spreading white hairs with conical bases, and hirtous, usually more sparsely so, on both surfaces, prominulously featherveined and somewhat reticulate, narrowly revolute-margined; heads solitary, about 2.2 cm. wide, at length nodding, terminating the branches, the peduncles 4 to 7 cm. long, naked, densely or sparsely pilose-hirsute with loose white hairs, most densely so just

below the head; disk in fruit 1.2 cm. high, 1.2 to 1.5 cm. thick; involucre 2-seriate, subequal, 6 to 8 mm. high, the phyllaries about 12, the outer linear to lanceolate narrowed to an acutish apex, thick-herbaceous, densely or sometimes sparsely hirsute, ciliate with spreading white hairs, on back more sparsely pilose-hirsute, the inner broader, lance-ovate, similarly pubescent on their exposed surface, all appressed or the outer slightly loose; rays 5 (or more?), yellow, neutral, the tube pilose, the lamina oblong-oval, 1 cm. long, 4.5 mm. wide; disk corollas yellow, glabrous except for a small tuft of hairs on teeth below apex, 6 mm. long (tube 1.7 mm., throat subcylindric, 3.6 mm., teeth deltoid-ovate, 0.7 mm.); pales obtuse, sometimes bluntly 3-toothed, 7 to 10 mm. long, hirsute at tip, resinous-glandular on costa and margin and toward apex; achenes thickened, obovoid-oblong, 5.2 to 6 mm. long, 1.8 mm. wide, very densely appressed-silky-pilose, without crustaceous margin; awns 2, slender, subequal or very unequal, 4.5 mm. long or less; squamellae none.

Type in the U. S. National Herbarium, no. 704387, collected in uplands on conglomerate, General Roca and vicinity, Río Negro Valley, Territory Río Negro, Argentina, altitude 250 to 360 meters, December 31, 1914, by Walter Fischer (no. 194).

Related to *Flourensia hirta* Blake, of the Province of Rioja, Argentina, which has 1 to 4 heads at the apex of the branches, broader leaves, smaller heads, and much ess pubescent involucre.

EXPLANATION OF PLATE 59.—*Flourensia hirtissima*, from the type specimen. Natural size.

Simsia sanguinea albida Blake, subsp. nov.

Rays white; otherwise as in small forms of the species.

Type in the Gray Herbarium, collected among stones on lightly wooded limestone hills, Uaxac Canal, Quen Santo, Huehuetenango, Guatemala, altitude 1,300 meters, July 21, 1896, by C. and E. Seler (no. 3098). Duplicates examined in the Berlin Herbarium.

Of interest as the first known form of the genus with white rays, those of all the others being yellow or (in the other forms of *S. sanguinea*) purple. The label of the type collection states that the rays are white and the disk reddish lilac. No form of *Simsia sanguinea* A. Gray has hitherto been reported from Guatemala, but non-typical specimens of *S. sanguinea palmeri* (S. Wats.) Blake were examined by the writer several years ago in the Berlin Herbarium, collected on lightly wooded limestone hills, Uaxac Canal, Quen Santo, Huehuetenango, Guatemala, August 23, 1896, by C. and E. Seler (no. 3027). This plant was previously known only from Jalisco.

Hymenostephium rudbeckioides (H. B. K.) Blake.

Gymnolomia rudbeckioides H. B. K. Nov. Gen. & Sp. **4**: 219. *pl. 374*. 1820.

The type of this species came from Ayavaca, Peru, and a photograph is in the Gray Herbarium. Specimens agreeing well with the original description and plate are in the National Herbarium, collected by C. H. T. Townsend (no. A90) at Sabiango, Ecuador, altitude 915 meters, November 26, 1910, and determined by Dr. J. M. Greenman as *Gymnolomia rudbeckioides*. The species has the pappus and all other features of *Hymenostephium*, and is the only representative of that genus known south of Colombia.

Zexmenia media Blake, sp. nov.

Herbaceous, the base not seen; stem simple, more or less striate-angulate, straight or flexuous, fuscous, densely strigose with tuberculate-based hairs, and more or less hispid-pilose with spreading or ascending hairs; leaves opposite, 3 to 7 pairs, the lower longer than the internodes; petioles flattened, hispid-pilose, 1 to 3 mm. long; blades elliptic-ovate, 3.5 to 7.5 cm. long, 1.3 to 3 cm. wide, obtuse to acutish, at base cuneate to rounded, serrulate, firm, erect, equally green on both sides, feather-veined or obscurely triplinerved, evenly but not densely hispid with curved, tuberculate-based, spreading hairs, these somewhat deciduous above in age; heads

2.8 cm. wide, in terminal cymes of 3; peduncles strigose and hispid-pilose, 3.5 to 6.5 cm. long; disk campanulate-hemispheric, 1 to 1.3 cm. high, 9 to 12 mm. wide involucre 3 to 4-seriate, subequal, 1 to 1.2 cm. high, the two outer series of phyllaries; elliptic or lance-elliptic, acute, appressed, herbaceous throughout or indurate at extreme base, densely hispid-pilose with tuberculate-based hairs, the inner series oblong-oval, acutish, strigillose and ciliate, with thin purplish-tinged apex; rays about 12, fertile, yellow, the lamina elliptic, emarginate, 9 mm. long, 1.5 mm. wide; disk corollas yellow, glabrous except for the hispid-pilose teeth, 7 to 8.5 mm. long (tube 2.5 to 3 mm., teeth 0.8 to 1.2 mm.); pales slender, acuminate, ciliolate and sparsely strigillose above, 1 cm. long; ray achenes trigonous, blackish, sparsely puberulous above, narrowly margined, 4 mm. long; awns 3, triangular to lanceolate, 1.5 mm. long or less; squamellae united into a denticulate corona 0.3 mm. high; disk achenes obovate, strongly compressed, striate, blackish, sparsely puberulous above, 4 mm. long, narrowly wing-margined, the margins continuous with the awns; awns slender, unequal, 2 to 3 mm. long; squamellae united into a corona about 0.3 mm. high, denticulate toward the margin.

Type in the U. S. National Herbarium, no. 301468, collected near Huejuquilla, Jalisco, Mexico, August 25, 1897, by J. N. Rose (no. 2549).

Zexmenia media is related to *Z. aurea* (D. Don) Benth. & Hook., and the collection on which the species is based was included under that species in W. W. Jones's revision of the genus. It is distinguished by its larger and more numerous leaves, its longer involucre of acute or acutish phyllaries, and the more developed squamellaceous corona.

Zexmenia michoacana Blake, sp. nov.

Trichotomously branched shrub; young branches striate-angulate, very densely hirsute-pilose with spreading, several-celled, tuberculate-based, dull whitish hairs; older branches and stem glabrate, gray-barked; internodes mostly 2.5 to 8 cm. long; leaves opposite; petioles pubescent like the stem, 2 to 10 mm. long; blades ovate, 5 to 10 cm. long, 2 to 5.5 cm. wide, acuminate, sometimes falcate, at base broadly rounded to cuneate, serrate or serrulate with 10 to 14 pairs of low acute or acutish teeth, papery or pergamentaceous, above deep green, harshly short-hispid (the hairs with persistent tuberculate bases), beneath lighter green, short-hispid-pilose along the veins and veinlets with spreading or divergent hairs, triplinerved from near the base and rather loosely prominulous-reticulate beneath; heads in anthesis about 1.5 cm. wide, in umbellate clusters of 1 to 6, terminal and in the axils of the upper leaves, on stout, densely spreading-hirsute-pilose pedicels 1 to 3.5 cm. long; disk 9 to 11 mm. high, 7 to 9 mm. thick, in fruit subglobose; involucre about 4-seriate, slightly graduate, 7 to (fruit) 10 mm. high, the two outer series of phyllaries oblong to oblong-ovate or triangular-ovate, or the inner deltoid-ovate, 2 to 6 mm. wide, obtuse to acute or subacuminate, appressed or at apex somewhat loose, rather densely hirsute-pilose and ciliate, with short, pale, indurate base and usually longer, 3 or 5-ribbed herbaceous tip; the two inner series oblong or oval-oblong, with subscarious, obtuse or rounded, ciliolate, otherwise essentially glabrous tip; rays about 8, fertile, yellow, the lamina oval, 7 to 10 mm. long, 4 mm. wide; disk corollas yellow, sparsely hispidulous on the back of the papillose-margined teeth, 6 mm. long (tube 1.7 mm., throat 3.5 mm., teeth 0.8 mm.); pales abruptly acuminate, with narrow spinulose keel, about 5.5 mm. long; ray achenes trigonous, 3.5 to 4 mm. long, narrowly subalate-marginate, the margins produced into 3 teeth or short awns 0.7 to 1.3 mm. long; disk achenes oblong or obovate-oblong, strongly compressed, blackish brown, glabrous, 3 to 4.5 mm. long, about 1.8 mm. wide, narrowly wing-margined on one side, narrowly margined on the other, the margins spinulose, continuous with the awns; awns 2, unequal, slender, spinulose, 2 to 3 mm. long, connected by a crown of lacerate, irregularly connate squamellae about 0.5 mm. high, the central squamella on each side sometimes 0.8 mm. long and acuminate.

Type in the U. S. National Hebarium, no. 1,000,061, collected at Loma Santa María, near Morelia, Michoacán, Mexico, altitude 1,950 meters, August 28, 1910, by G. Arsène (no. 5829).

ADDITIONAL SPECIMENS EXAMINED:

MICHOACÁN: Patzcuaro, November 2, 1895, *C. & E. Seler* 1200 (Gray Herb.). Loma Santa María, altitude 1,900 meters, August 15, 1909, *Arsène* 3060. Cerro de las Nalgas, near Morelia, altitude 2,100 meters, September 9, 1909, *Arsène* 2651.

Nearest *Zexmenia fruticosa* Rose, but with more numerous heads, on pedicels much shorter than the leaves, and with much more densely pubescent young branchlets.

Zexmenia rotundata Blake, sp. nov.

Trichotomously branched shrub; branchlets greenish, sparsely strigillose; stem slender, fuscous, glabrous, lenticellate; internodes mostly 3.5 to 7 cm. long; leaves opposite; petioles slender, strigose and hirsute-ciliate, 6 to 8 mm. long; blades lance-ovate, the larger 5.5 to 8 cm. long, 2 to 2.8 cm. wide, falcate-acuminate, at base cuneate, serrulate with 8 to 11 pairs of low acutely mucronulate teeth, papery, above light green, evenly but sparsely hirsute with white hairs with persistent lepidote-tuberculate bases, beneath scarcely lighter green, similarly pubescent with more appressed hairs with scarcely tuberculate bases and longer along the veins, triplinerved above the base and loosely prominulous-reticulate; heads about 11 mm. wide in flower, in cymose clusters of 3 to 6 at apex of stem and in the uppermost axils, the pedicels densely strigillose, mostly 6 to 12 mm. long, rarely obsolete or up to 18 mm. long, disk 8 to 11 mm. high, about 5 mm. thick; involucre about 5-seriate, strongly gradu; ate, 8 to 9 mm. high, appressed, the outermost phyllaries 2, very small, oblong, about 2.8 mm. long, obtuse, the others suborbicular to (innermost) broadly oval, all broadly rounded, with pale, indurate, essentially glabrous base, several-vittate above, and subequal or shorter, densely strigillose and ciliate, thin-herbaceous tips, the innermost with submembranous tips; rays about 4, fertile, yellow, the lamina suborbicular-tridentate, 5.5 mm. long, 4.5 mm. wide; disk flowers about 19, their corollas yellow, slender, very sparsely hispidulous at base of the sinuses between the papillose-margined teeth, otherwise glabrous, 6.6 mm. long (tube 2 mm., throat 4 mm., teeth 0.6 mm.); pales obtuse, sometimes abruptly narrowed below apex, spinulose-ciliolate above and toward tip of the narrow keel, about 6.5 mm. long; ray achenes (immature) trigonous, narrowly margined, 3.2 mm. long, the margins produced into 3 subequal awns 2 mm. long, adnate to the few unequal squamellae (the longer 1.3 mm. long); disk achenes (immature) compressed, 3 mm. long, alate-margined on the inner angle, the margin continuous with the awn, marginless and 2-awned on the outer angle, the 3 awns subequal, 4.2 to 4.8 mm. long, linear-lanceolate, connected by a crown of lacerate, connate squamellae 0.5 to 0.8 long, these sometimes produced on one side into a slender awn, this 3 mm. long or sometimes equaling the three chief awns.

Type in the U. S. National Herbarium, no. 302455, collected at Huasemote, Durango, Mexico, August 14, 1897, by J. N. Rose (no. 3478).

Zexmenia rotundata is related to *Z. ceanothifolia* (Willd.) Schultz Bip., *Z. fasciculata* (DC.) Schultz Bip., and *Z. gradata* Blake, but differs from all these in its very broadly rounded phyllaries.

Zexmenia gradata Blake, sp. nov.

Shrub, up to 3 meters high; stem 2 cm. thick below, lenticellate, gray-barked, glabrous; branches whitish, striatulate, strigose or strigillose with scarcely tuberculate-based hairs; internodes mostly 4.5 to 14 cm. long; leaves opposite; petioles strigillose or strigose and sometimes hirsute-ciliate, 4 to 12 mm. long; blades oblong-elliptic to ovate, 7 to 12.5 cm. long, 2.3 to 5.3 cm. wide, acuminate, usually falcate, at base acutely cuneate to rounded-cuneate, serrate or crenate-serrulate with 11 to 25 pairs of low mucronulate teeth, membranous or papery, above deep green, harshly

and rather sparsely tuberculate-hispidulous or short-hispid, beneath densely hirsute-pilose on all the veins and veinlets, sometimes also between them, with spreading or divergent, rarely antrorse hairs with scarcely tuberculate bases, triplinerved above the base and rather loosely prominulous-reticulate beneath; heads 1 to 1.3 cm. wide, in small umbelliform fascicles or panicles of 7 to 20 at apex of stem and branches and in the uppermost axils, the pedicels densely strigillose, slender, usually 7 to 15 mm. long, sometimes up to 3.2 cm.; disk 8 to 11 mm. high, about 4 mm. thick; involucre about 5-seriate, strongly graduate, appressed, 6 to 7.5 mm. high, the outermost phyllaries ovate or oblong-ovate, acute or acutish, the others suborbicular or deltoid-ovate to broadly oval, 2.5 to 3.5 mm. wide, obtuse to acute, never acuminate, with pale, indurate, somewhat strigillose or subglabrous base, and shorter, barely subherbaceous, densely strigillose and short-ciliate or ciliolate tip, the innermost with subscarious, rounded or obtuse, ciliolate, otherwise subglabrous tips; rays 8, fertile, yellow, the lamina oval, tridentate, 5 to 6.5 mm. long, 2.3 to 3 mm. wide; disk flowers about 13, their corollas yellow, slender, very sparsely hispidulous-pilosulous, 7 mm. long (tube 1.8 mm., throat 4.5 mm., teeth 0.7 mm.); pales obtuse, usually abruptly contracted below the apex, spinulose-ciliolate on the narrow keel and at apex, about 6 mm. long; ray achenes trigonous, narrowly alate-margined, 2.8 to 3.5 mm. long, the margins spinulose, continuous with the 3 unequal or subequal awns, these 1.5 to 3.2 mm. long, connected at base by an entire or sparsely spinulose crown of completely connate squamellae, 0.2 to 0.7 mm. high; disk achenes oblong-cuneate, compressed, 3.5 mm. long, 1 mm. wide, alate-margined on one side (the margin spinulose, decurrent on its awn), 2 or sometimes 3-awned, the awns slender, acuminate, very unequal or subequal, the longer 2.5 to 2.8 mm. long, connected by a crown of connate, ciliate or lacerate squamellae 0.3 to 0.8 mm. long.

Type in the U. S. National Herbarium, no. 305446, collected at Lodiego, Sinaloa, Mexico, October 9 to 15, 1891, by Edward Palmer (no. 1578).

ADDITIONAL SPECIMEN EXAMINED:

SINALOA: Cofradia, October 26 and November 5, 1904, *Brandegee.*

All the material listed above has been referred to *Zexmenia fasciculata* (DC.) Schultz Bip., and the type collection was, with some hesitation, recorded under that name in W. W. Jones's revision [17] of the genus. Examination of the type collection (*Berlandier* 2134) of that species in the Gray Herbarium shows, however, that it differs in having ovate, acuminate or subacuminate, much less strongly graduate phyllaries. *Pringle* 3753 and 11560, and *Palmer* 155 (of 1885) and 1100 (of 1878–79) agree with it, and represent a plant specifically distinct from the one here described as new. *Zexmenia gradata* is more closely related to *Z. ceanothifolia* (Willd.) Schultz Bip., but in that species the awns are mostly longer than the body of the disk achenes, and are conspicuously exserted in the fruiting heads.

Zexmenia cordifolia Blake, sp. nov.

Shrub; stem and branches subterete, densely pilose with sordid, several-celled, loosely spreading hairs, in age gray, glabrate; leaves opposite; petioles pilose, 1 to 2 mm. long; blades ovate, 5 to 6 cm. long, 2.8 to 3.5 cm. wide, acute, at base shallowly cordate, serrate throughout with low triangular teeth, triplinerved and loosely prominulous-venose, nearly equally green on both sides, above sparsely strigose, beneath sparsely strigose on the veins and strigillose between them; heads about 1.5 cm. wide, in several-headed terminal and axillary umbelliform cymes; pedicels strigillose, 6 to 27 mm. long; disk cylindric-turbinate, 7 to 9 mm. high, 4 to 5 mm. thick; involucre 5-seriate, strongly graduate, 8 mm. high, with one or two small herbaceous bracts at base, the phyllaries all appressed, the outermost ovate, acute, herbaceous above the short indurate base, strigose, the next series similar but oval, obtusish, the inner series cuneate-oval, thinner, strigillose on their exposed surface,

[17] Proc. Amer. Acad. **41**: 156. 1905.

erose-ciliate at the rounded, faintly greenish, reticulate-venose, submembranous tip; rays yellow, pistillate, the lamina linear-elliptic, 6 mm. long; disk corollas yellow, glabrous except for the hispidulous teeth, 6 mm. long (tube 2.2 mm.); pales slender, tridentate with acuminate central tooth, 6 mm. long; disk achenes (very immature) sparsely strigillose above, narrowly 2-winged, 2 mm. long; awns 2, slender, unequal, 2.5 to 3.2 mm. long; squamellae united into an erose-denticulate crown 0.2 to 0.3 mm. long.

Type in the U. S. National Herbarium, no. 302273, collected near Acaponeta, Tepic, Mexico, July 30, 1897, by J. N. Rose (no. 3297).

Zexmenia cordifolia is nearest *Z. fasciculata* (DC.) Schultz Bip., but is distinguished by its broader, subsessile, cordate-based leaves. The type specimen consists of a leafy portion of the stem, a branch bearing only old heads, and a single detached flowering head.

Zexmenia aggregata Blake, sp. nov.

Shrub; stem and older branches slender, brownish gray, lenticellate, glabrous; younger branches rather densely hirsute with spreading hairs; internodes 2 to 5.5 cm. long; leaves opposite; petioles narrowly margined above, densely hirsute, 4 to 6 mm. long; blades ovate, 4 to 5.5 cm. long, 1.8 to 2.6 cm. wide, acuminate, at base rounded or cuneate-rounded and usually unequal, then narrowly cuneate into the petiole, serrulate with about 10 pairs of low acute teeth, papery, above deep green, harshly antrorse-hirsute with lepidote-tuberculate-based hairs, beneath lighter green, rather softly hirsute-pilose with spreading hairs along all the veins and veinlets, triplinerved above the base, prominulous-reticulate beneath; heads about 1.7 cm. wide, in terminal and axillary fascicles of 1 to 4 toward tips of branches, the fascicles subtended by foliage leaves, the pedicels very densely spreading-hirsute, 1.4 cm. long or less; disk narrowly obovoid, about 13 mm. high, 6 mm. thick; involucre about 3-seriate, 9 to 10.5 mm. high, the two outer series of phyllaries few (about 4), subequal, lance-ovate, subcaudate-acuminate, hispid-pilose, hispidulous, and ciliate or ciliolate, with pale somewhat indurate base and much longer, rather loose, herbaceous tip, the innermost series equal or shorter, with submembranous or obscurely herbaceous, ciliolate and somewhat puberulous tips; rays about 4, fertile, yellow, the lamina oval, bidentate, 8 mm. long, 5 mm. wide; disk corollas yellow, on teeth slightly hispidulous outside, papillose-margined within, otherwise glabrous, 6 mm. long (tube 1.2 mm., throat slender-funnelform, 4 mm., teeth 0.8 mm.); pales obtuse, 1-nerved, 1-toothed on each side, spinulose-ciliolate at apex, otherwise glabrous, about 6.5 mm. long; ray achenes (immature) trigonous, very narrowly wing-margined, spinulose-ciliolate, 3-awned, the awns unequal, 1.5 mm. long or less, connected by a corona of lacerate, connate squamellae about 0.5 mm. long; disk achenes (submature) narrowly cuneate, compressed, hispidulous, 4.8 mm. long, 1.2 mm. wide, narrowly wing-margined on one side, the margin decurrent on the awn; awns 2, subequal, narrowly lanceolate, flattened, about 4.5 mm. long; squamellae connate, spinulose-ciliolate, about 0.5 mm. high, adnate to the awns.

Type in the U. S. National Herbarium, no. 574587, collected at Santa Catarina, Oaxaca, Mexico, July 14, 1910, by H. H. Rusby (no. 86).

Related to *Zexmenia elegans* Schultz Bip., of which the type, in the Gray Herbarium, has been examined. In that species the leaves are very sparsely pubescent beneath, and the phyllaries are much broader, while the disk achenes are smaller and have shorter awns.

Zexmenia macropoda Blake, sp. nov.

Shrub; stem stoutish, dull gray, subterete, strigose, glabrescent; leaves opposite; petioles flattened, hispid-pilose, 7 to 12 mm. long; blades lance-ovate, 7 to 12 cm. long, 2.8 to 4 cm. wide, long-acuminate, at base cuneate to rounded-cuneate, serrate with appressed teeth, membranaceous, triplinerved and somewhat prominulous-reticulate beneath, above tuberculate-hispid especially along costa, in age harshly

tuberculate, beneath slightly paler green, hispid-pilose with spreading hairs on the veins. evenly but not densely hispidulous-pilosulous and gland-dotted between them; heads about 2.5 cm. wide, umbellate in clusters of 4 to 10 at ends of branches; peduncles 2 to 8 cm. long, hispid-pilose with spreading or ascending hairs; disk campanulate, 1 to 1.5 cm. high, 8 to 12 mm. wide; involucre 4-seriate, slightly graduate, 1 to 1.3 cm. high, the two outer series of phyllaries narrowly lanceolate to triangular-lanceolate, acuminate, with short indurate base and herbaceous spreading or reflexed tip, hispid-pilose with spreading hairs, the third series oval, obtuse, with indurate base and shorter subchartaceous tip, sparsely pubescent on middle of back, the inmost similar but essentially glabrous except for the submembranous ciliolate tip; rays about 15, yellow, fertile, the lamina elliptic, 8 to 12 mm. long, 2.5 mm. wide; disk corollas yellow, glabrous except for the hispidulous teeth, 8.5 mm. long (tube 2.8 mm., teeth 0.8 mm.); pales 9 mm. long, abruptly acuminate, keeled, puberulous on back; ray achenes trigonous, very narrowly or obsoletely wing-margined, hispidulous, 5 mm. long, the awns 3 to 4, lanceolate, 1 to 3 mm. long, continuous with the wings, the squamellae about 0.5 mm. high, united into a denticulate crown; disk achenes obovate, strongly compressed, blackish, sparsely hispidulous, the very narrow white wing-margins continuous with the awns; awns 2, unequal, slender, 3.5 to 4.5 mm. long, united at base by a narrow crown; free squamellae none.

Type in the Gray Herbarium, collected at Sololá, Guatemala, altitude 2,130 meters, January 25, 1915, by E. W. D. Holway (no. 109). Photograph in the U. S. National Herbarium.

This species is related to *Z. frutescens* (Mill.) Blake, formerly known as *Z. costaricensis* Benth. It differs from that species in its longer peduncles and much larger heads, and in involucre characters.

Zexmenia subsericea Blake, sp. nov.

Shrub; branches slender, somewhat costate-angulate, densely hispid with whitish, glandular-tuberculate-based, curved, ascending or spreading hairs, in age grayish-barked; leaves opposite; petioles 1 to 1.5 mm. long, pubescent like the stem; blades lanceolate, 2 to 3 cm. long, 4 to 7 mm. wide, acuminate, at base short-acuminate, entire, revolute-margined, triplinerved, firm, above dark green, densely and harshly hispid with glandular-tuberculate-based hairs and gland-dotted between them, beneath subsericeously canescent-pilose with long, ascending, rather soft hairs with scarcely enlarged bases, densely gland-dotted between them; peduncles solitary at apex of stem and branches, hispid and glandular, 3 to 6.5 cm. long; heads subhemispheric, 2 cm. wide or more; disk 9 to 11 mm. high, 13 to 18 mm. thick; involucre about 5-seriate, graduate, 7 to 8 mm. high (excluding the leaflike outer phyllaries), the 2 or 3 outer series with ovate indurate base and reflexed herbaceous tip 1 to 1.8 cm. long, this similar to the leaves in shape and pubescence; inner series oval, acutish, indurate, with short, narrow, abrupt or obscure, herbaceous apex, hispid-pilose and glandular chiefly down middle and on margin; rays 8 or more, fertile, the lamina oval, emarginate, hispid-pilose on nerves of back, 8 mm. long, 3.5 mm. wide; disk corollas 4 mm. long, the slender tube and narrowly funnelform throat subequal, subglabrous, the ovate recurved teeth 0.7 mm. long, papillose on margin and papillose-crested at apex outside; pales very slender, carinate, spinulose-dentate on margin and on keel except at base, 7 mm. long; ray achenes trigonous, blackish, 3 mm. long, rather narrowly 3-margined, the margins spinulose, the pappus of 3 spinulose-serrate awns, that on the inner angle 2 mm. long, those on the outer angles 0.7 to 1 mm. long; disk achenes oblong-obovate, 3 mm. long, 1.8 mm. wide, the body blackish, more or less tuberculate-hispidulous, the two rather narrow, subequal, crustaceous, whitish wing-margins spinulose-ciliate, the pappus of two spinulose awns 1.5 to 2.5 mm. long, and on each side between them about 3 lanceolate, acute, spinulose-ciliate, basally united squamellae 0.3 to 0.5 mm. long.

Type in the U. S. National Herbarium, no. 862061, collected at Agua Blanca, Guatemala, November, 1913, by R. Tejada (no. 57).

Zexmenia subsericea is at once distinguishable from *Z. brevifolia* and *Z. gnaphalioides* A. Gray, its nearest relatives, by its narrowly lanceolate acute-based leaves, as well as by the character of its pubescence.

Zexmenia oyedaeoides Blake, sp. nov.

Shrub; stem and branches densely hispid-pilose with appressed whitish hairs glabrescent, very densely tuberculate with the persistent hair bases; internodes 9 to 18 mm. long; leaves opposite; petioles densely hispid-pilose, 5 to 12 mm. long; blades lanceolate to lance-ovate, 6 to 9 cm. long, 1.7 to 2.7 cm. wide, long-acuminate, acute at base, serrate with about 16 pairs of depressed teeth, thick, above densely, cinerascently, and rather softly short-hispid with incurved tuberculate-based hairs, beneath cinereously hispid-pilose with very dense ascending hairs (those along the veins deciduous and tuberculate-based), triplinerved about 1.5 cm. above the base; only the primary veins evident beneath; heads about 2.5 cm. wide, about 7 in ternately divided corymbs about 5 cm. wide terminating stem and branches, overtopped by the leaves, the bracts lanceolate, 2 cm. long or less; disk 1.2 cm. high, 8 to 14 mm. thick; involucre 3-seriate, 7 mm. high, slightly graduate, the phyllaries lance-ovate or narrowly oblong-ovate, densely hispid-pilose with appressed tuberculate-based hairs, indurate and whitish below, the longer subherbaceous apex acute, appressed, the innermost with thinner apex; rays 12, fertile, yellow, the lamina oblong-oval, tridenticulate, 12 mm. long, 4 mm. wide, hispidulous on the nerves of the back; disk corollas yellow, glabrous except for the papillose teeth, very slender, 6 mm. long (tube 2 mm. long); pales acuminate, hispidulous above, carinate, 7 mm. long; immature ray achenes 3-awned and with several squamellae; immature disk achenes linear, somewhat contracted at apex, densely appressed-pubescent, 5 mm. long, narrowly winged; pappus awns 2, unequal, 5 mm. long or less; squamellae about 10, those on each side of achene united nearly to apex into a lacerate scale 2 mm. long, the whole united at base to the awns.

Type in the Gray Herbarium, collected at Valle Dupena (?), Santa Marta, Colombia, by William Purdie.

A plant very similar in appearance to the smaller-headed species of *Oyedaea*, such as *O. reticulata*, but with the fertile rays of *Zexmenia*. It does not appear to be very closely allied to any described species of *Zexmenia*.

Otopappus scaber Blake, sp. nov.

Frutescent, evidently scandent; stem slender, strigillose, striatulate; branches opposite, spreading at a right angle; leaves opposite; petioles slender, strigillose, 3 to 7 mm. long; leaf blades elliptic-ovate or oblong-ovate, 4.5 to 9 cm. long, 1.8 to 3.5 cm. wide, acute or acuminate, rounded at base, serrulate (teeth 12 to 15 pairs, acute, short), firmly pergamentaceous, deep green and somewhat shining on both sides, or above in age fuscous green, above harshly and evenly hispidulous with antrorse mostly deciduous hairs with persistent tuberculate bases, beneath evenly but not densely antrorse-hispidulous on veins and surface with persistent scarcely tuberculate-based hairs, triplinerved about 2 mm. above the base, loosely prominulous-reticulate beneath, the veins on the upper surface usually impressed; heads 2.7 to 3 cm. wide, in terminal cymes of 3 or 5, the peduncles 1- or rarely 2-headed, 1.2 to 3.5 cm. long, densely strigillose, subtended by leaves 3.5 to 5 cm. long; disk campanulate-subglobose, 1 to 1.2 cm. high and thick; involucre about 5-seriate, graduate, 5 to 6 mm. high, the 1 or 2 outermost series of phyllaries spatulate, about 6 mm. long, herbaceous essentially throughout, spreading or reflexed from near the base, rounded or apiculate, tuberculate-hispidulous, the middle series oblong or oblong-ovate, pale and indurate, ribbed and vittate, strigillose, with very short, obtuse, spreading, herbaceous apex, the 2 inner series similar but subacute and without herbaceous apex; rays about 9, pistillate, pale yellow (?), the lamina elliptic, tridenticulate, 11 mm. long, 3.5 mm. wide; disk corollas pale yellow (?), 6.5 mm. long (tube 1.5 mm., throat 4 mm., teeth 1 mm.), the teeth with a dorsal papillose-hispidulous crest; pales

narrow, acuminate, keeled, hispidulous on keel and margin, 8 to 10 mm. long; ray achenes (immature) trigonous, narrowly 3-winged, 3.5 mm. long, the wings hispidulous, the pappus a cup of more or less completely united fimbriate squamellae 1 mm. long, the wing of inner angle of achene sometimes adnate to the pappus and broadly produced above it; disk achenes (immature) 2-winged at least above, the wings adnate to the pappus awns, the broader 1 mm. wide, the narrower about 0.4 mm. wide; pappus of 2 unequal awns about 1 to 2.5 mm. long and several fimbriate squamellae, connate at least below, obtuse, 1 to 1.2 mm. long.

Type in the U. S. National Herbarium, no. 396844, collected at Apazote, near Yahaltun, Campeche, Mexico, December 26, 1900, by E. A. Goldman (no. 482).

Related to *Otopappus verbesinoides* Benth., as which this specimen has been recorded by Greenman,[18] but differing in its harshly hispidulous leaves.

Verbesina oxylepis Blake, sp. nov.

Erect perennial herb, 35 to 50 cm. high; stems solitary or few from a short rootstock with slender fibrous roots, slender, striatulate, rather densely strigillose; lowest leaves opposite, reduced, the others alternate, their blades linear to lance-linear, 3 to 5.5 cm. long, 5 to 6 mm. wide, acuminate, obtuse at the subsessile base, sparsely serrulate, usually conduplicate, firm, uniformly but not densely strigillose above, pale green and strigose beneath (the hairs with glandular-tuberculate bases), feather-veined and prominulous-reticulate beneath; heads 1 to 6 in a terminal cyme, 2.5 to 3.5 cm. wide; peduncles strigillose, 1.5 to 6.5 cm. long; disk hemispheric, 9 to 11 mm. high, 9 to 12 mm. thick; involucre 3-seriate, scarcely graduate, 7 to 9 mm. high, the phyllaries with lance-ovate somewhat indurate body and shorter or nearly as long, loosely spreading, attenuate, herbaceous apex, rather densely incurved-pubescent with more or less tuberculate-based hairs; rays about 10, yellow, the lamina elliptic-oblong, 1.5 cm. long; disk corollas yellow, densely pilose on tube, sparsely so on throat, 3.5 mm. long (tube 0.6 mm.); pales acutish, rather broad, yellow-tipped, ciliolate above, sparsely pubescent on costa, 6.5 mm. long; achenes obovate-oval, blackish, 1-ribbed and papillose-hispidulous on the sides, 2-winged, 3.5 mm. long, 3 mm. wide; awns 2, slender, equal, smoothish, 1.6 mm. long.

Type in the U. S. National Herbarium, no. 42953, collected at Río Blanco, Jalisco, Mexico, 1886, by Edward Palmer (no. 167).

Verbesina oxylepis is related to *V. stricta* (Hemsl.) A. Gray, but is readily distinguished by its narrow leaves and longer, attenuate phyllaries.

Verbesina synotis Blake, sp. nov.

Stem stout, pithy, herbaceous, glabrous, striate, greenish plum-color, somewhat glaucous; leaves opposite; petioles broadly margined, 2 to 4.5 cm. long, 1 to 1.3 cm. wide, the margins united at base into subentire auricles about 1.5 cm. wide; blades triangular or ovate-triangular, 7 to 9.5 cm. long, 3.5 to 6 cm. wide, broadest at base, acuminate, at base cuneate or rounded-cuneate and abruptly contracted into the margined petiole, doubly serrulate with close callous-tipped teeth, papyraceous, triplinerved and prominulous-reticulate beneath, above somewhat harshly strigillose and strigose, glabrescent, beneath densely and griseously soft-pilose, with rather short loosely spreading hairs; uppermost leaves alternate, considerably reduced; heads in fruit turbinate-hemispheric, 1 cm. high, 1 to 1.3 cm. wide, very numerous in convex terminal panicles 9 to 13 cm. wide; pedicels loosely hispidulous-pilosulous with several-celled hairs, mostly 3 to 10 mm. long; involucre 2-seriate, about 5 mm. high, the phyllaries very unequal, linear-lanceolate, acuminate, callous-tipped, stramineous, glabrescent; rays fertile, yellow, the lamina elliptic, tridenticulate, 8 mm. long, 2.5 mm. wide; disk corollas about 16, yellow, glabrous, 7 mm. long (tube 1.3 mm.); pales narrowly lanceolate, with acuminate callous tip, pubescent above, 8 to 10 mm. long; achenes cuneate-obovate, pale, rather narrowly 2-winged, 5.5 mm. long, 3 mm. wide, the wings ciliolate; awns 2, unequal, slender, strigillose, about 2 mm. long.

[18] Field Mus. Bot. **2**: 270. 1907.

Type in the U. S. National Herbarium, no. 571206, collected at San Ramón, Durango, Mexico, April 21 to May 18, 1906, by Edward Palmer (no. 185).

This species evidently belongs in the section *Saubinetia*, but it is so distinct in foliage characters that it scarcely requires comparison with any of the described species.

Verbesina otophylla Blake, sp. nov.

Shrub; stem somewhat branched, grayish barked, glabrous; branches striate, glaucescent, somewhat strigillose, densely leafy; leaves alternate, lanceolate or elliptic-lanceolate, 7.5 to 10.5 cm long, 1 to 1.3 cm. wide, acuminate, narrowed to a sessile auriculate-clasping base (about 4.5 mm. wide), serrate above the entire lower third with 11 to 15 pairs of low, acutely mucronulate teeth, narrowly revolute-margined, firm-papery, above deep green, densely strigillose except near midrib with deciduous hairs with lepidote-tuberculate bases, smoothish to the touch, beneath slightly lighter green, glabrous except for a few obscure hairs on costa and sometimes on the veins, featherveined, the veins about 11 pairs, prominulous beneath, the secondaries closely reticulate but scarcely prominulous; peduncle terminal, few-bracteate, 2.8 cm. long; heads 5, cymose, 1.2 to 1.4 cm. wide, on slightly strigillose, angulate pedicels 6 to 20 mm. long, these subtended by linear bracts 7 mm. long or less; disk hemispheric, 7 to 8 mm. high, 1 to 1.4 cm. thick; involucre about 3-seriate, slightly graduate, 6 to 7 mm. high, the phyllaries oblong, appressed, obtuse to (inner) acutish, subherbaceous, dull olive-green, ciliolate, dorsally glabrous, obscurely 2-ribbed; rays about 8, fertile, yellow, the lamina elliptic-oblong, tridenticulate, 4.5 mm long, 1.5 mm. wide; disk corollas yellow, pilose on tube and sparsely so on throat with slender many-celled hairs, 3.6 mm. long (tube 0.7 mm., throat subcylindric, 2.4 mm., teeth 0.5 mm.); pales oblong, obtuse, 4.8 mm. long, ciliate on the narrow keel and on margin above, pilose above; disk achenes obovate, flatly compressed, the body black, glabrous, 3 to 3.5 mm. long, 1.3 mm. wide, the 2 wings white, erose-ciliolate, at apex widest (0.7 to 1 mm. wide), adnate to the awns for 0.7 to 1 mm.; awns 2, unequal, slender, hispidulous, 1.5 to 2.5 mm. long.

Type in the U. S. National Herbarium, no. 1,012,315, collected at Hacienda Buena Vista, about 20 miles east of Abasolo, Tamaulipas, Mexico, June 18, 1919, by E. O. Wooton.

This species belongs in the section *Saubinetia*, and is somewhat related to *Verbesina nelsonii* Robins. & Greenm., which has very much larger leaves and spreading-tipped pales. In leaf outline it is similar to *V. persicaefolia* DC., but in that species the leaves have an unmargined petiole. The vernacular name is given as "jara."

Verbesina cymbipalea Blake, sp. nov.

Base not seen; stem herbaceous, terete, either naked or narrowly winged by the decurrent petiole bases, densely tuberculate-hispidulous with spreading hairs; leaves alternate; petioles naked, 3 to 6 mm. long, in well-developed stems decurrent on the stem, forming wings about 1.5 mm. wide and 1.5 to 5 cm. long; blades lance-elliptic, 7 to 16 cm. long, 1.5 to 4 cm. wide, acuminate at each end, serrulate mostly above the middle with 6 to 8 pairs of mucronulate teeth, papyraceous, feather-veined and loosely prominulous-reticulate beneath, above dull green, harshly hispidulous with deciduous hairs with persistent glandular-tuberculate bases, beneath much paler green, evenly but sparsely hispidulous with spreading tuberculate-based hairs; heads about 1.3 cm. wide, numerous in terminal divergently branched panicles 6 to 15 cm. wide; pedicels densely hispidulous, mostly 1.5 to 3 cm. long; disk subglobose, in fruit 6 to 8 mm. high, 7 to 10 mm. thick; involucre 2-seriate, 2 mm. high, slightly graduate, radiating in fruit, the phyllaries oblong or oval, obtuse, subcoriaceous, obscurely ciliolate, sparsely strigillose; rays elliptic, the lamina 3 mm. long; disk corollas densely pubescent on tube, sparsely so above, 2.8 mm. long

(tube 0.5 mm.); pales boat-shaped, firm, 3.5 mm. long, with short, reflexed, submucronate tip and ciliolate keel; achenes broadly obovate, blackish, sparsely pubescent above, 3 to 3.5 mm. long, 2.5 mm. wide (including the wings); wings about half as wide as body of achene, the inner one ciliolate throughout, the outer only at apex; awns 2, unequal, about 1.5 mm. long.

Type in the U. S. National Herbarium, no. 305418, collected at Tepic, Territory of Tepic, Mexico, January 5 to February 6, 1892, by Edward Palmer (no. 1954).

This species belongs in the section *Saubinetia*, and is related to *V. seemannii* Schultz Bip. and *V. angustifolia* (Benth.) Blake. From the first it differs in its densely hispidulous stems and distinctly winged achenes, from the second in its larger leaves and longer petioles, and from both in the wings of the stem (when present). The type sheet bears two specimens, apparently differing only in the fact that in one the stem is winged, in the other wingless. If further material should show that these belong to two different species, it is to the one with winged stems that the name should be restricted.

Verbesina synethes Blake, sp. nov.

Shrub; branch (or upper part of stem) stout, subterete, striate, wingless, densely spreading- or reflexed-puberulous with dull white hairs, glabrate; leaves alternate; petioles narrowly winged essentially to base, 2 to 3.5 cm. long, about 2 mm. wide near base, sordidly spreading-puberulous, not auriculate or decurrent; blades ovate, 11.5 to 15 cm. long, 4.5 to 6 cm. wide, acuminate, at base cuneate or rounded-cuneate, then narrowly decurrent on the petiole, serrulate or crenate-serrulate above the entire lower portion (teeth about 20 pairs, depressed, obtuse, mucronulate), papery, above dull green, densely and rather softly puberulous with mostly spreading subglandular-based hairs, beneath densely griseous-pilosulous with crisped, more or less spreading hairs; panicle terminal, many-headed, flattish, about 9.5 cm. wide, densely grisous-pilosulous with spreading hairs, the pedicels 7 to 14 mm. long; heads 9 mm. wide; disk subglobose, 6 to 7 mm. high and thick; involucre 3-seriate, graduate, 3 to 4 mm. high, the phyllaries elliptic or ovate (outermost) to oblong or obovate-oblong, the outer obtuse, the inner with short erectish or somewhat spreading apiculations, all pale greenish or whitish, the outermost subherbaceous, the others subchartaceous with scarious margin and obscurely subherbaceous tip, densely short-ciliate and toward margin and near apex pilosulous, the apiculation subglabrous; rays 8, fertile, white, the tube hispidulous, the lamina oval, 2 or 3-denticulate, 5-nerved, 3.5 mm. long, 2.2 mm. wide; disk flowers about 29, the corollas white, pilosulous chiefly on tube and teeth, 2.5 mm. long; pales apiculate, puberulous on costa and at apex, 4 mm. long; achenes (both ray and disk) obovate, compressed, hispidulous, 3.5 mm. long, 1.6 mm. wide, very narrowly 2-winged, the wings adnate to the base of the awns: awns 2, subequal or unequal, 2 mm. long or less.

Type in the U. S. National Herbarium, no. 1,042,424, collected in open loam between Fusagasuga and Pandi, Department of Cundinamarca, Colombia, altitude 1,000 to 1,300 meters, November 30, 1917, by F. W. Pennell (no. 2724).

A member of the section *Ochractinia*, nearest *V. acuminata* DC., in which the leaves are narrower, soon very smooth above, and much less densely pubescent beneath. Similar in the form and pubescence of the leaves to *V. szyszylowiczii* Hieron., but in that species the leaves are "sessile" (i.e., the petiole is broadly margined to the base) and decurrent on the stem.

Verbesina laevis Blake, sp. nov.

Shrub; stem (or branch) striate, glabrous, more or less glaucous; leaves all opposite, the blades 3 to 6 cm. long, 1.2 to 3 cm. wide, oval to oblong-elliptic, acutish to obtuse, mucronulate, at base rounded or cordate-rounded, sessile, and somewhat clasping, obscurely serrulate with very depressed callous-mucronulate teeth, glabrous and somewhat glaucous on both sides, greenish or pale beneath, coriaceous, feather-veined with 7 to 9 pairs of lateral veins, prominulous-reticulate above, more

finely reticulate but scarcely prominulous beneath; heads discoid, numerous in terminal, flat-topped, ternately divided, hispidulous-strigillose, cymose panicles 4 to 10 cm. wide; pedicels 4 mm. long or usually less, often obsolete; disk cylindric becoming turbinate, 10-flowered, 6 to 7 mm. high, 2 to 6 mm. wide; involucre 2-seriate, graduate, 3 to 4 mm. high, the phyllaries few, oblong, obtuse, indurate-subherbaceous, striate, usually ciliolate, with several reduced phyllaries or bracts at base; corollas glabrous, 4.5 mm. long (tube 0.8 mm., teeth deltoid, 0.6 mm. long); pales obtuse, glabrous, blackish green above, 5.5 mm. long; achenes obovate, blackish, essentially glabrous, 4 to 5 mm. long, narrowly winged, the wings adnate to the base of the awns; awns 2, unequal, slender, 2.5 to 3.5 mm. long.

Type in the Gray Herbarium, collected in the Province of Chachapoyas, Peru, by A. Mathews; photograph in the U. S National Herbarium. Duplicate in the Torrey Herbarium of the New York Botanical Garden.

Verbesina laevis belongs in the section *Lipactinia*, and is readily distinguished by its glabrous and glaucous stem and its thick, opposite, sessile leaves with callous marginal mucronulations.

Verbesina crassiramea Blake, sp. nov.

"Tree;" branches stout, 8 to 10 mm. thick, angulate, pithy, densely pilose-tomentose with sordid matted hairs; leaves alternate; petioles stout, unmargined, densely and sordidly pilose-tomentose, not auriculate or decurrent, 3 to 7.5 cm. long; blades oval to ovate, 10 to 22 cm. long, 4.5 to 10 cm. wide, obtusish, at base cuneate-rounded to broadly truncate-rounded, subentire or obscurely dentate-serrulate, papyraceous, feather-veined (lateral veins about 8 pairs) and more or less prominulous-reticulate beneath, above dull green, rather densely pilose with somewhat tuberculate-based mostly deciduous hairs, beneath densely pilose-tomentose with matted sordid-griseous hairs; heads discoid, 5 to 9-flowered, very numerous in terminal and subterminal sordidly pilose-tomentose panicles 12 to 25 cm. wide, about equaling the leaves; pedicels mostly obsolete, rarely up to 5 mm. long; disk cylindric becoming hemispheric, 9 to 11 mm. high, 3 to 7 mm. thick; involucre 2-seriate, graduate, 3.5 mm. high, the phyllaries few, oblong, obtuse, subherbaceous, somewhat indurate below, sparsely pubescent and ciliate, the outer more decidedly herbaceous; corollas "yellow" (?), pilose below and on nerves above, 5 mm. long (tube 1 mm.); pales obtuse, apiculate, ciliate toward apex, more or less pilose, with greenish back or midrib, about 6 mm. long; achenes cuneate-obovate, 5 mm. long, 2 mm. wide, blackish, essentially glabrous, strongly 1-nerved on each face, very narrowly winged, the wings adnate to base of awns; awns 2, slender, equal, smooth and glabrous, 3.5 mm. long.

Type in the U. S. National Herbarium, no. 603096, collected at La Peña, Colombia, altitude 2,800 meters, July, 1911, by Brothers Apollinaire and Arthur (no. 13).

OTHER SPECIMENS EXAMINED:

COLOMBIA: Mountain slope, altitude 2,700 to 2,800 meters, September 30, 1917, *Pennell* 2280 (N. Y. Bot. Gard.). Laguna de Verjón, altitude 2,800 meters, October 10, 1917, *Ariste Joseph* A32.

This species belongs in the *V. arborea* group of the section *Lipactinia*, and is particularly distinguished by its dense sordid pubescence, and its sparsely pubescent involucre.

Verbesina pennellii Blake, sp. nov.

"Tall shrub;" stem herbaceous above, subterete, densely sordid-pubescent with subglandular matted hairs, glabrescent below; leaves alternate (only the upper seen); petioles pubescent like the stem, naked except toward apex, 2 to 2.8 cm. long; blades ovate or oblong-ovate, 5.5 to 9 cm. long, 2.8 to 3.5 cm. wide, obtuse or acute, at base cuneate-rounded, then cuneate into the petiole, papyraceous, sparsely and finely denticulate, above dull green, rather densely and harshly hispid-pilose with incurved, glandular-tuberculate-based, at length deciduous hairs, beneath densely sordid-pilose with matted hairs, the lateral veins about 6 pairs; panicles

terminating stem and branches, many-headed, the terminal one convex, 13.5 cm. wide, pubescent like the stem, the pedicels mostly 1 to 3 mm. long; heads oblong, discoid, 6 to 7 mm. high, 3.5 to (fruit) 4.5 mm. thick, 10 or 11-flowered; involucre 2-seriate, unequal, about 4 mm. high, the phyllaries oblong-ovate or the outer ovate, obtuse or the outer acutish, whitish, subindurate, ciliate and sparsely pilosulous; corollas whitish, 3.5 to 4 mm. long (the obscure tube 0.4 to 0.8 mm. long) , sparsely appressed-pilose, densely so on the teeth; pales greenish toward the obtuse or slightly apiculate tip, 5 to 6 mm. long, above sparsely pilose on back and ciliate; achenes compressed, obovoid, 3.5 mm. long, the body 1 mm. wide, blackish, glabrous, 2-winged, the wings narrow below, broader above (0.6 mm.wide) and adnate to the bases of the awns; awns 2, unequal, finely hispidulous, 3.2 mm. long or less.

Type in the herbarium of the New York Botanical Garden, collected in open thicket in the Cordillera Oriental, east of Neiva, Department of Huila, Colombia, altitude 1,300 to 1,800 meters, August 1 to 8, 1917, by H. H. Rusby and F. W. Pennell (no. 992). Duplicate in the U. S. National Herbarium.

A member of the section *Lipactinia*, related to *V. arborea* H. B. K., but distinguished by its smaller leaves with different pubescence, and its merely pilosulous, not lanate, phyllaries.

Verbesina baccharidea Blake, sp. nov. PLATE 60.

Tall shrub with simple branches; stem and branches angulate, sulcate, 2 to 6 mm. thick, grayish fuscous, densely appressed-puberulous, in age glabrate; leaves alternate; petioles densely appressed-puberulous, not margined or auriculate, 1 to 6 mm. long; blades elliptic, 2.8 to 6.5 mm. long, 8 to 23 mm. wide, acute, callous-tipped, at base cuneate, callous-denticulate above the lower third with 6 to 9 pairs of very depressed teeth, subcoriaceous, penninerved (lateral veins 7 to 12 pairs, impressed above, scarcely prominulous beneath), deep green and strigillose on both sides, slightly roughened beneath; heads discoid, about 60-flowered, in dense, terminal, flattish or convex panicles of 5 to 21, equaling or slightly surpassing the leaves; peduncles and pedicels densely and sordidly lanate-pilose, the pedicels 3 to 20 mm. long; disk subglobose, many-flowered, 1 to 1.5 cm. high, 1.2 to 1.6 cm. thick; involucre about 3-seriate, subequal, 6 to 7 mm. high, densely and sordidly lanate-pilose, the phyllaries oblong,callous-tipped, subherbaceous; corollas "greenish white," sparsely pilose on the obconic-cylindric limb and teeth, 5.8 mm. long (tube 1.5 to 2 mm. long, swollen at base in age); pales acute to acuminate, more or less callous-tipped, pubescent, blackish green above, 7 to 9 mm. long; achenes obovate, strongly compressed, blackish, very narrowly winged, spinulose-ciliolate, 4.5 mm. long, 1.8 mm. wide; awns 2, slender, spinulose-ciliolate, subequal, 3 mm. long.

Type in the U. S. National Herbarium, no. 888454, collected at Guadalupe, near Bogotá, Colombia, 1911, by Brother Ariste Joseph (no. A245).

ADDITIONAL SPECIMEN EXAMINED:

COLOMBIA: Bushy slope, above Bogotá, altitude 2,700 to 2,800 meters, August 16, 1917, *Rusby & Pennell* 1270.

Verbesina baccharidea is a member of the section *Lipactinia*, related to *V. guianensis* Baker and *V. schomburgkii* Sch. Bip., but differing in its much smaller leaves, pubescent pales, and other characters.

EXPLANATION OF PLATE 60.— *Verbesina baccharidea*, from the type specimen. Natural size.

Coreopsis buchii (Urban) Blake.

Selleophytum buchii Urban, Rep. Spec. Nov. Fedde **13**: 484. 1915.

A specimen of this plant, collected on a cliff near Fond Parisien, Etang Saumatre, Haiti, May 5 to 13, 1920, by Emery C. Leonard (no. 4103), is in the National Herbarium. It agrees well with Urban's detailed description based on *Buch* 1137 from Morne la Selle, Haiti, and shows that his genus *Selleophytum*,[19] based on this

[19] Op. cit. 483.

species, is a synonym of *Coreopsis*. The species goes readily in the subgenus *Leptosyne*, section *Electra* (DC.) Blake,[20] where it is characterized by its entire, sessile, cordate-based, lanceolate or lance-elliptic leaves and solitary or ternate heads. *Selleophytum* was placed near *Zinnia* by Urban, presumably because its rays are somewhat persistent, but has no relationship whatever with that genus. The species is of interest as the sole indigenous West Indian representative of its genus.

Coreopsis oblanceolata Blake, sp. nov.

Frutescent; stem slender, striate, fuscous, glabrous; leaves opposite, rather crowded below, remote above, 2.5 to 3.8 cm. long, 5 to 7.5 mm. wide, oblanceolate, acutish or obtuse, obtusely callous-mucronulate, tapering from above the middle into a petiolelike base, entire, coriaceous, slightly revolute, 1-nerved with obscure lateral veins, glabrous, equally green on both sides; peduncles monocephalous, naked or bracteate, terminal and from the upper axils, sparsely incurved-pubescent at apex, 11 cm. long or less; heads 4 cm. wide; disk hemispheric, about 1.2 cm. high, 1 cm. wide; outer phyllaries about 8, herbaceous, narrowly oblong, slightly narrowed at base, rounded or obtuse, ciliolate, very sparsely pubescent at base, 3-vittate, 5.5 mm. long, 1.8 mm. wide; inner phyllaries oblong-obovate, acute or acuminate, membranaceous, densely lineate with purplish-brown, and with narrow yellow margin, erose-ciliolate at tip, 7.5 mm. long, 2 mm. wide; rays 8 or more, yellow, neutral, the lamina elliptic-oblong, bidentate, 2 cm. long, 6 mm. wide; disk flowers yellow, pilose at apex of tube, with narrowly funnelform throat, 4.2 mm. long (tube 1.3 mm.); pales elliptic-ovate, acuminate, ciliate below, erose-ciliate toward tip, 5 mm. long; achenes (immature) oblong-elliptic, pubescent on one face, densely long-ciliate on margins, ciliate at apex, 4 mm. long; awns 2, lance-linear, subequal, densely upward-ciliate, 2.2 mm. long; style with short, triangular, acute, papillose appendages.

Type in the herbarium of the Field Columbian Museum, no. 298515, collected on the top of the western Cordillera opposite Huancabamba, Peru, altitude 2,440 to 2,900 meters, September 26, 1911, by C. H. T. Townsend (no. A211). Photograph and fragments in the U. S. National Herbarium.

This species is at once distinguishable, among the South American forms, by its oblanceolate, entire, coriaceous leaves.

Coreopsis longula Blake, sp. nov.

Shrub, with slender, striate-angled, essentially glabrous stem and branches, the internodes 4 to 22 mm. (usually about 10 mm.) long; leaves opposite, the upper sometimes with small fascicles in their axils, linear-filiform, entire, 2.5 to 7 cm. long, 0.6 to 1 mm. wide, obtuse, ascending, thick, flattish, glabrous, light-puncticulate, the costa obscure, slightly sulcate above and beneath, the bases connate; heads terminating stem and branches, solitary or usually in twos or threes, about 2 cm. wide; peduncles slightly thickened upwardly, 1 to 2 cm. long, sordid-pilose with inflexed hairs, glabrate, naked or 1-bracteolate; disk campanulate-hemispheric, 9 mm. high, 7 to 10 mm. thick; involucre at base slightly sordid-tomentose and glabrate, otherwise glabrous; outer phyllaries 8, herbaceous, lance-subulate, obtuse, appressed, 1-nerved, 2 to 4 mm. long, 1 mm. wide at base; inner phyllaries 8, elliptic-oblong, truncate or obtuse, blackish-green with narrow yellow margin, 7 to 8 mm. long, 1.8 to 2 mm. wide; rays probably 8, neutral, golden-yellow, pilose on tube, the lamina oval-oblong, sparsely pubescent on back, 8 mm. long, 3.8 mm. wide; disk corollas golden-yellow, essentially glabrous, 4.4 mm. long (tube 1.4 mm., the funnelform throat and teeth 3 mm. long); pales linear-oblong, 6 mm. long, obtuse, sparsely pilose on midline of back, golden-yellow with about 7 orange-brown vittae; achenes linear-oblong, 5.5 mm. long, 1.3 mm. wide, densely pilose-ciliate, rather densely pilose on inner face and at apex between the awns, sparsely so on outer face, unmargined; awns 2, linear-lanceolate, upwardly pilose-ciliate, subequal, about 1.8 mm. long.

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[20] Proc. Amer. Acad. **49**: 337. 1913.

Type in the Gray Herbarium, collected in the Province of Chachapoyas, Peru, by A. Mathews. Photograph in U. S. National Herbarium.

This species is related to *Corcopsis venusta* H. B. K., the only other South American species with always entire, linear-filiform leaves. In that Ecuadorian species the leaves are shorter and broader (about 3.7 cm. long and 1.5 mm. wide), the heads are solitary and long-peduncled, and the outer phyllaries are oblong.

Coreopsis triloba Blake, sp. nov.

Shrub; stem and branches slender, striate, densely leafy, in youth pilose-tomentose at the tips, soon glabrate; internodes mostly 2 to 8 mm. long, sometimes as much as 2 cm.; leaves opposite, glabrous; petioles 1 to 1.5 cm. long, as broad as the blades, connate at base into a cup 0.5 to 1 mm. high; blades 8 to 20 mm. long, rarely entire and linear-filiform, usually partly into 3 linear-filiform, subulate-tipped, coriaceous lobes, entire or the middle one sometimes 3-parted, 0.3 to 0.8 mm. wide; heads usually in 3's at tips of stem and branches, rarely solitary, about 1.5 cm. wide; peduncles pilose-tomentose, soon glabrate, 1 to 6 cm. long; disk 6 to 8 mm. wide; hemispheric; involucre 6 to 8 m. high; outer phyllaries 8, lanceolate to lance-ovate, obtusish, thick-herbaceous, appressed or slightly loose, green with 3 dark stripes; glabrous, 2.5 to 3 mm. long, 0.8 to 1.2 mm. wide; inner phyllaries about 8, oblong-elliptic, obtuse, membranaceous, brown with narrow yellow border, glabrous; rays yellow, the lamina oval, about 6 mm. long; pales (immature) acutish, spinulose-ciliolate at apex, glabrous dorsally; achenes (very immature) ciliolate, with 2 upwardly hispid-ciliate, paleoliform awns 0.8 mm. long.

Type in the U. S. National Herbarium, no. 534665, collected in Ecuador, without definite locality, by W. Jameson. A duplicate is no. 534651, U. S. National Herbarium.

From its only close ally, *C. capillacea* H. B. K., this species may be distinguished by its lanceolate to lance-ovate outer phyllaries, only one-half as long as the inner (in *C. capillacea* lance-linear, two-thirds as long as the inner)

Coreopsis townsendii Blake, sp. nov.

Shrub, trichotomously branched, with erect densely leafy branches; stem slender, quadrangular, striate, greenish, glabrous; leaves opposite, the blades parted into 3 linear entire lobes, these acute, coriaceous, 1-nerved, glabrous or sparsely and obscurely pubescent along costa beneath, 7 to 23 mm. long, 1 to 1.5 mm. wide; petioles of equal breadth, 1 to 2.5 cm. long, connate at base; heads 2.5 to 3 cm. wide, in 3's at apex of stem and of subterminal branchlets; peduncles slender, striate, with 1 or 2 linear bracts, loosely pilose, densely so just below the head, 1 to 5.5 cm. long; disk hemispheric, 7 mm. high, 7 to 10 mm. thick; outer phyllaries 6, herbaceous, linear-oblong, obtuse to rounded, 3-vittate, ciliate below the middle, otherwise glabrous, 4 to 4.5 mm. long, 1 to 1.2 mm. wide; inner phyllaries membranaceous, elliptic-oblong, obtuse, erose-ciliolate at apex, yellow, densely striped with purple-brown, 8 mm. long, 2.5 mm. wide; rays 8, yellow, neutral, the lamina oval, 13 mm. long, 7 mm. wide; disk corollas yellow, glandular-puberulous at apex of tube, on the campanulate funnelform throat sparsely pilose above with many-celled hairs, 3 to 3.2 mm. long (tube 1 mm.); pales oblong, about 5-vittate, erose-ciliolate at the obtuse apex, 3.3 to 4 mm. long; achenes oblong, blackish, glabrous on the faces, densely long-ciliate, 3.5 mm. long; awns 2, paleiform, lanceolate, trigonous, equal, densely upward-ciliate, 1.3 mm. long; style with deltoid, obtusish, papillose appendages.

Type in the herbarium of the Field Columbian Museum, no. 298496, collected at Huascaray, Peru, altitude 1,980 to 2,285 meters, September 10, 1911, by C. H. T. Townsend (no. A 192). Photograph and fragments in the U. S. National Herbarium.

Coreopsis townsendii is related to *C. capillacea* H. B. K., described from "Andibus Peruviae?", but is distinguished by its ternately arranged heads, broader and entire leaf segments, linear-oblong outer phyllaries, and campanulate-funnelform disk corol-

las. It differs from *C. triloba* Blake in its broader leaf segments and ciliate or ciliolate phyllaries.

Coreopsis boliviana Blake, sp. nov.

Shrub; stem slender, glabrate, grayish-barked; branches striate, hirtellous or hispidulous with spreading hairs; internodes mostly 1 to 3.5 cm. long, the upper as much as 6 to 7.5 cm.; leaves opposite, sometimes with fascicles in the axils; petioles 8 to 10 mm. long, about as broad as the rachis, united at base into a hirtellous cup 1.5 to 2 mm. high; blades 1.5 to 1.8 cm. long and about as wide across the lobes, ternately parted, the lobes 3 to 5-parted or the terminal one again ternately divided with 3-parted lobes, the ultimate divisions linear, subulate-tipped, glabrous, coriaceous, 2 to 6 mm. long, 0.8 to 1 mm. wide, slightly broader than the rachis; heads solitary or in pairs at tips of stem and branches, 3.5 to 5 cm. wide; peduncles sordidly pilose-tomentose below the head, glabrate, naked or with a single bract, 6 to 12 cm. long; disk hemispheric, rounded, 1 cm. high and wide; involucre 10 to 12 mm. high, reflexed in age; outer phyllaries 8, narrowly ovate-oblong, obtusish, appressed, thick-herbaceous, green with about 5 dark stripes, sordid-tomentose at base, glabrescent, 4 to 4.5 mm. long, 1.2 to 1.5 mm. wide; inner phyllaries about 9, oblong-elliptic, obtuse, membranous, brown with narrow yellow margin, more or less sordid-pilose on back below the apex; rays about 8, golden-yellow, the lamina elliptic, glabrous, 2 cm. long; disk corollas yellow, glabrous, 5.5 mm. long (tube 1.6 mm.); receptacle flattish; pales membranous, obtuse, pilose on back, ciliate at apex, 6 mm. long; achenes (immature) linear-oblong, 5 mm. long, densely villous-ciliate, sparsely villous down midline on both faces; awns 2, paleiform, pilose-ciliate, 2.2 mm. long.

Type in the U. S. National Herbarium, no. 42950, collected near La Paz, Bolivia, altitude 3,050 meters, October, 1885, by H. H. Rusby (no. 1685). Duplicate in the Gray Herbarium.

This species is nearest the Peruvian *C. spectabilis* A. Gray, which has the stem and involucre glabrous and the leaves larger and with more numerous lobes.

Calea pennellii Blake, sp. nov.

Low, branching shrub; branches stout, densely pilose with dull matted hairs; leaves opposite; petioles 2.5 mm. long, stout, pubescent like the stem; blades oval-ovate, 3.5 to 4.7 cm. long, 1.5 to 2.5 cm. wide, acute, callous-apiculate, at base rounded, coriaceous, serrulate with about 14 pairs of callous teeth, grayish green above, rather densely pilose with tuberculate-based hairs, beneath densely and griseously pilose-tomentose with matted hairs, triplinerved and prominent-reticulate; peduncles axillary and terminal, monocephalous, stout, pubescent like the stem, 7 to 14 cm. long; disk 2 to 2.5 cm. wide, 1 to 1.5 cm. high; involucre about 4-seriate, scarcely graduate, the outer phyllaries about 5, obovate or spatulate, 10 to 17 mm. long, 2.5 to 6 mm. wide, coriaceous-herbaceous, similar to the leaves but much smaller, appressed or slightly spreading; inner phyllaries broadly oval, brownish and scarious, slightly indurate below, lacerate-erose, somewhat ciliate or essentially glabrous; rays yellow, the tube glabrous, 5 mm. long, the lamina narrowly cuneate, 11 mm. long, 4 mm. wider, deeply and irregularly 3-lobed; disk corollas golden yellow, glabrous, 6.5 mm. long (tube 2.5 mm., throat funnelform, 2.8 mm., teeth ovate, 1.2 mm.); disk achenes blackish brown, glabrous, 3 mm. long; pappus of 20 linear-lanceolate aristate-tipped awns 5 mm. long.

Type in the U. S. National Herbarium, no. 1042047, collected on bushy slope at base of mountain, Chapinero, near Bogotá, Department of Cundinamarca, Colombia, altitude 2,700 to 2,800 meters, September 18 to 23, 1918, by F. W. Pennell (no. 1999).

Related to *Calea peruviana* (H. B. K.) Benth., which has the leaves hirtous-pubescent above and canescent-villous beneath, and the outer phyllaries nearly 3 cm. long, much longer than the inner.

Calea ovalis Blake, sp. nov. PLATE 61.

Shrub; stem stout, striatulate, hispidulous; leaves opposite; petioles stout, 2 to 3 mm. long, hispidulous; blades oval, 6.5 to 8 cm. long, 3.7 to 4.8 cm. wide, broadly rounded at apex, obscurely cordate at base, coriaceous, crenate-dentate (teeth about 12 pairs, depressed), slightly revolute-margined, scabrid-hispid and somewhat shining above, beneath paler green, sparsely hispidulous chiefly along the veins, densely and strongly prominent-reticulate especially beneath, the lateral veins about 8 pairs; heads in terminal clusters of about 5, subtended by small leaves, 10 to 11 mm. high, 8 to 10 mm. thick, on pedicels 1 to 1.8 cm. long; involucre 3-seriate, graduate, 9 mm. high, the outer phyllaries 4, ovate or oblong-ovate, 5 mm. long, more or less hispidulous, with indurate base and coriaceous-herbaceous, obtuse, slightly loose apex; the inner broadly oval or oblong-oval, with indurated base and shorter, scarious, yellowish-brown, rounded apex, slightly ciliolate or essentially glabrous; ray flowers about 8, their corollas yellow, usually irregularly bilabiate and with traces of stamens, the lamina erect, elliptic, 6 mm. long; disk corollas yellow, glabrous, 6.5 mm. long (the stout tube 2 mm. long, the throat funnelform-campanulate, 3.5 mm. long, the teeth ovate, 1 mm. long); achenes of ray and disk similar, sparsely hispidulous, 1.8 mm. long; pappus of about 20 linear-lanceolate acuminate awns 4.5 mm. long.

Type in the U. S. National Herbarium, no. 1,041,957, collected on open slope at Monte Redondo, south of Quetame, Department of Cundinamarca, Colombia, altitude 1,600 to 2,000 meters, September 6, 1917, by F. W. Pennell (no. 1821).

Related to *Calea tolimana* Hieron., which has ovate or subelliptic leaves, glabrous phyllaries, and achenes 2.5 mm. long.

EXPLANATION OF PLATE 61.—*Calea ovalis*, from the type specimen. Natural size

Calea sororia Blake, sp. nov.

Probably frutescent; stem stoutish, terete, striatulate, brownish, densely and sordidly tomentose-pilosulous with loosely spreading, tuberculate-based, mostly deciduous hairs; leaves opposite; petioles densely griseous-tomentose, naked, 4 to 6 mm. long; blades broadly ovate, 3 to 5.5 cm. long, 2.5 to 4.5 cm. wide (those just below the inflorescences smaller), acute, mucronulate, cuneate to broadly rounded-cuneate at base, coarsely crenate-dentate with 5 to 7 pairs of large, broadly triangular or ovate-triangular, obtuse or acute, mucronulate teeth, triplinerved, impressed-veined above, reticulate-veined beneath, papyraceous, above dull green, densely and rather harshly hispid with yellowish, several-celled, subtuberculate-based, spreading hairs, beneath densely and softly griseous-pilose-tomentose with several-celled loosely spreading hairs; peduncles numerous, axillary and terminal, umbellately clustered, griseously pilose-tomentose, 1 to 3.5 cm. long, bearing at apex a close cluster of 6 to 8 heads, subsessile or on pedicels 2 mm. long or less; heads cylindric-turbinate, discoid, 7.5 to 9 mm. high, 3.5 to 5 mm. thick; involucre about 5-seriate, graduate, 5.5 to 6 mm. high, the outermost phyllaries about half as long as the inmost, narrowly oblong to oblong-ovate, acute, sordidly griseous-pilosulous, with indurate base and subequal, acute, herbaceous, appressed or spreading apex; the next series similar, broader, with longer, indurate, pale, subglabrous base and short, appressed, sordid-pilosulous, acute, herbaceous tip; the inner similar but with the herbaceous tip obsolete, often mucronulate; the inmost obtuse, subglabrous; disk flowers 13; corollas yellowish (?), sparsely glanduliferous on tube and at base of throat, 4.5 mm. long (tube 2 mm., enlarged below, the campanulate throat 0.5 mm. long, the oblong-lanceolate, obtuse, terminally thickened teeth 2 mm. long); pales scarious, acutish, denticulate above, 5 mm. long; achenes blackish-brown, cylindric-obovoid, slightly thickened, ciliate on the obscure angles, 3 mm. long; pappus awns about 10, lanceolate or oblong-lanceolate, acuminate or mostly obtuse, spinulose on margin, persistent, 1 to 1.5 mm. long.

Type in the U.S. National Herbarium, no. 252633, collected near Neutón, Huehuetenango, Guatemala, altitude 915 to 1,220 meters, December 13 to 15, 1895, by E. W. Nelson (no. 3544).

This new species is related to *C. albida* A. Gray and *C. hypoleuca* Robins. & Greenm., differing from the former in its larger, more densely pubescent leaves and smaller, less herbaceous outer phyllaries, and from the latter in its narrow heads, less prominently herbaceous outer phyllaries, and narrower, not papyraceous, inner phyllaries.

Calea leptocephala Blake, sp. nov.

Shrub; stem slender, puberulous in lines, glabrate; leaves opposite; petioles sordidly incurved-puberulous, 4 to 6 mm. long; blades ovate, those of the stem 5.5 to 8.5 cm. long, 3.5 to 5 cm. wide, acuminate with very acute, sometimes falcate tip, at base cuneate, coarsely serrate above the entire base with 6 to 8 pairs of acutely mucronulate teeth, submembranous, above deep green, sparsely strigillose with mostly deciduous hairs, in age bullate and roughish, beneath scarcely lighter green, very sparsely pilosulous on the veins, especially the larger ones, and densely dotted with shining yellowish glands on surface, triplinerved above the base, the nerves impressed above, beneath with the secondaries loosely prominulous-reticulate; heads cylindric or narrowly turbinate-cylindric, 5 mm. wide, in ternately or quinately divided panicles at tip of stem and branches, the central cluster sessile or subsessible, of (1) 5 to 8 heads, the lateral clusters on peduncles 2 to 3.2 cm. long, subtended by small or minute bracts (2.5 cm. long or usually much less), the pedicels incurved-puberulous and gland-dotted, 3 mm. long to almost none; disk 6.5 high, 2 mm. thick; involucre about 5-seriate, strongly graduate, 5 to 5.5 mm. high, the phyllaries few (about 11), the outer ovate, about 1.8 mm. long, acutish, appressed, whitish and indurate with obscurely herbaceous tip, ciliate chiefly below apex, on back glabrous or sparsely pubescent on costa, 1 or 3-nerved, the others oblong-ovate to oblong, whitish, subchartaceous with subscarious margin and apex, glabrous except for the ciliolate and sometimes glandular margin, the apex obtuse, involute-margined, at length brownish, spreading; ray 1, pale yellow, glabrous, the tube becoming 2 mm. long, the lamina ovate, tridenticulate, 2 mm. long, 1.5 mm. wide; disk flowers 3 or 4, pale yellow, glabrous, 3.8 to (in age) 4.2 mm. long (tube 1.2 to (in age) 1.8 mm., throat campanulate, 0.8 mm., teeth lanceolate, 1.5 to 1.8 mm.); pales broad, scarious, bluntly 3 or 4-dentate, ciliolate at apex, 5 mm. long; achenes of ray and disk similar, obconic-cylindric, subterete, 2.5 to 3 mm. long, hispid-pilose in lines, blackish, with conspicuous, thick, whitish carpopod; pappus 1 mm. long, of 10 subequal, oblong, obtuse, minutely denticulate, palaceous squamellae.

Type in the U. S. National Hebarium, no. 1,014,202, collected at Tonameca, Oaxaca, Mexico, November 9, 1917, by B. P. Reko (no. 3544),

Related to *Calea zacatechichi* Schlecht., but distinguished by its smaller, fewer-flowered heads and subcylindric involucre with spreading-tipped phyllaries.

Calea tejadae Blake, sp. nov.

Frutescent(?); stems or branches slender, subterete, striate, densely and cinerously pilose-tomentose with several-celled, subglandular-based, matted hairs; leaves opposite; petioles naked, griseous-pilose-tomentose, 5 to 6 mm. long; blades ovate, 3.5 to 4.5 cm. long, 1.8 to 2 cm. wide, acute, cuneate at base, triplinerved, somewhat reticulate beneath, thickish, crenate-serrate with about 6 pairs of depressed mucronulate teeth, above dull green, densely and rather softly hispid-pilose with several-celled ascending hairs with subglandular bases, beneath very densely griseous-pilose-tomentose with matted hairs, subrufescent along the veins; peduncles numerous, axillary and terminal, 1.3 to 2 cm. long, densely griseous-pilose-tomentose, bearing 7 to 15 umbellately clustered heads, on pedicels 2 to 6 mm. long; heads discoid, 7 mm. high, 13-flowered; involucre 6-seriate, strongly graduate, ellipsoid, 4.5 to 5 mm. high, 2.5 to 3 mm. thick, the outermost phyllaries suborbicular, very short, the others oblong to oval-oblong, all siccate-indurate, without herbaceous tips, obtuse or rounded, ciliolate, otherwise essentially glabrous; corollas yellowish (?), gla-

brous, 3.5 mm. long (tube 1.3 mm.) the campanulate throat 0.7 mm. long, the oblong-lanceolate, recurved, apically thickened teeth 1.5 mm. long; pales subtruncate, sparsely glandular-ciliolate at apex, 4.2 mm. long; achenes blackish, obconic, pubescent, 2.5 mm long; pappus awns 9, oblong, obtuse, subequal, denticulate, 1 mm. long.

Type in the U. S. National Herbarium, no. 862066, collected at Agua Blanca, Guatemala, November, 1913, by R. Tejada (no. 80).

Calea tejadae is distinguished from *C. zacatechichi* Schlecht., its nearest ally, by its dense pubescence.

Calea brevipes Blake, sp. nov.

Shrub; stem densely pilose with matted grayish hairs, densely leafy; leaves opposite; petioles 1 to 2 mm. long, pilose-tomentose; blades narrowly ovate, 2.5 to 3 cm. long, 1 to 1.2 cm. wide, acute, at base broadly rounded to subcordate, coriaceous, crenate-serrulate, slightly revolute-margined, above dull green, densely and harshly hispid-pilose with tuberculate-based hairs, beneath densely and griseously pilose-tomentose, triplinerved and prominulous-reticulate beneath, the veins impressed above; peduncles terminating stem and branches, ternately arranged, 7 to 10 mm. long, bearing usually 3 sessile heads; heads discoid, ellipsoid, 10 or 11-flowered, 7 mm. high, 3 mm. thick in flower; involucre about 3-seriate, graduate, 5 mm. high, usually subtended by 1 or 2 elliptic or lanceolate, herbaceous-tipped bractlets about 3 mm. long, the phyllaries few, the outermost ovate or lance-ovate, acute, with indurate base and subherbaceous tip, densely sordid-pubescent chiefly above the middle, the inner phyllaries elliptic-oblong or elliptic, obtuse, with yellowish white indurate base and yellow or brownish yellow scarious apex, few-nerved, lacerate-ciliate, otherwise glabrous; corollas yellow, glabrous, at maturity 4.5 mm. long (tube slender, somewhat dilated at base, 2.2 mm. long, throat campanulate, only 0.5 mm. long, teeth lanceolate, 1.8 mm. long); pales scarious, deeply lacerate above, obtuse or acute, glabrous, 1-nerved, 4.5 mm. long; achenes blackish, sparsely hispidulous above, 2 mm. long; pappus of 22 linear-lanceolate serrulate awns 4 mm. long.

Type in the U. S. National Herbarium, no. 1,042,835, collected on edge of forest at El Convenio, west of San Lorenzo, Department of Tolima, Colombia, altitude 1,000 to 1,200 meters, December 29 to 30, 1917, by F. W. Pennell (no. 3463).

This species is related to *Calea glomerata* Klatt, also of Colombia, which has peduncles 10 to 18 mm. long and broader ovate leaves 1.5 to 2 cm. wide.

Calea pachyphylla (Klatt) Blake.

Aspilia pachyphylla Klatt, Leopoldina **23**: 143. 1887.

Actinomeris pachyphylla Schultz Bip.; Klatt, Leopoldina **23**: 143. 1887, as synonym.

Altamirania pachyphylla Greenm. Proc. Amer. Acad. **39**: 106. Sept. 25, 1903. Not *Altamiranoa* Rose, Sept. 12, 1903.

Aspiliopsis pachyphylla Greenm. Bot. Gaz. **37**: 222. 1904.

This plant is obviously closely allied to the Caleas of the section *Tetrachyron*, having the same habit, involucre, and achenes. The type species of that group, *C. manicata* (Schlecht.) Benth. & Hook., has a pappus of only 4 unequal awns. In *C. brandegei* Greenm. the 4 awns or squamellae are unequal, linear, and almost bristle-form. In *C. rupestris* T. S. Brandeg. the pappus consists of about 7 to 10 unequal awns or squamellae. *C. platyphylla* represents a further step in the direction of *Viguiera*, having the parts of its pappus readily separable into awns and squamellae. Its relationship to the species of the section *Tetrachyron*, which as above indicated are rather variable in pappus characters, is so close that it is inadvisable to attempt to separate it generically.

Klatt's name was doubtfully referred to *Altamirania pachyphylla* by Greenman when he described the plant as a new genus (*Altamirania*). The new name *Aspiliopsis*, proposed because of the slightly earlier publication of a genus *Altamiranoa* by Rose'

was first published in a supplementary leaflet (unpaged) distributed with Contribution 25 (new series) of the Gray Herbarium. Klatt's plant is represented in the Gray Herbarium by a leaf and fruiting head from the type (*Liebmann* 452, from "St. Gertrudes," Mexico), in addition to a good sketch of the specimen and drawings of floral details. Although the achenes examined show scarcely any squamellae, these are clearly indicated in Klatt's drawings, and the correspondence in other respects with Greenman's type (*Nelson* 829, from near Totontepec, Oaxaca) is so close as to leave no doubt that *Aspilia pachyphylla* and *Altamirania pachyphylla* are identical.

Tridax oligodonta Blake, sp. nov.

Suffrutescent?, with few opposite or alternate branches, nearly naked above; stem slender, densely hispid-pilose with spreading griseous hairs, some of which are tipped with dark glands; leaves opposite, those subtending the elongate branches of the inflorescence often alternate; petioles narrowly margined, densely pubescent like the stem, 5 to 8 mm. long; blades ovate or sometimes oval, 2 to 2.5 cm. long, 8 to 14 mm. wide, acute or obtuse, mucronulate, at base cuneate to broadly rounded, remotely serrulate (teeth low, acute, 2 or 3 pairs), densely pilose with ascending hairs on both sides, tripli- or subquintuplinerved, the veinlets obscure; heads few, about 2 cm. wide, the peduncles monocephalous, 3.5 to 9 cm. long, densely hispidulous-pilosulous and less densely pilose with longer hairs tipped with dark glands, the hairs all spreading and several-celled; disk broadly campanulate, 1.4 cm. high, 1 to 1.5 cm. thick; involucre about 4-seriate, strongly graduate, 10 mm. high, the outermost phyllaries small, oval, rounded, with whitish-green base and subequal, appressed, subherbaceous tip, rounded or rarely acute, ciliolate, pilosulous and glandular-pilose, several-nerved, the middle ones similar but larger, the inner oval-oblong, rounded, somewhat puberulous, not ciliolate, with somewhat loose, purplish, subscarious tips; rays about 5, fertile, the lamina cuneate-suborbicular, rosy or whitish in the dried state, 9 to 11 mm. long, 8 to 10 mm. wide, crenately 3-toothed with very short broadly rounded teeth, the 2 inner basal lobes minute, roundish, about 0.1 mm. long; disk corollas (in the dried state) deep green or blackish green above, densely pilose on tube and base of throat with simple hairs (a few gland-tipped hairs intermixed), papillose-ciliolate on teeth, 7.8 mm. long (tube 2.8 mm., throat subcylindric, 3.8 mm., teeth ovate, acutish, 1.2 mm.); pales oblong, dentate, abruptly acuminate, glandular-vittate, glabrous, 7 to 8 mm. long; ray achenes densely silky-pilose, their pappus of 10 linear-lanceolate plumose awns 1.5 mm. long; disk achenes (submature) obovoid, compressed, densely silky-pilose, 3 mm. long, with prominent, thick, crustaceous carpopod; their pappus of 20 linear or linear-lanceolate, acuminate, unequal, plumose awns 2.5 to 4 mm. long.

Type in the U. S. National Herbarium, no. 1,023,201, collected in the vicinity of Las Juntas, near Loja, Ecuador, September 28, 1918, by J. N. Rose, A. Pachano, and G. Rose (no. 23892). Additional specimen, with the same data, collected as no. 23168.

Related to *Tridax stuebelii* Hieron., also Ecuadorian, which according to description has lanceolate, entire or denticulate leaves 4 cm. long and 7 mm. wide, and ray achenes with the pappus scanty or none. The rays in *T. oligodonta* bear at the apex of the tube 1 to 3 linear appendages 0.6 mm. long or less, suggesting abortive stamens.

HELENIEAE.

Trichocoryne Blake, gen. nov.

Simple or subsimple herbaceous perennial, with a slender rootstock; leaves opposite, linear, entire, sessile, glandular-punctate, connate at base; heads solitary at apex of stem and branches, pedunculate, white, heterogamous; involucre 2-seriate, subequal, of 10 broad, rounded, flat, membranous-herbaceous phyllaries; receptacle convex, obtusish, muricate, epaleaceous; rays 5 to 7, white, sterile, the lamina

spreading, cuneate, emarginate; disk flowers numerous, hermaphrodite, fertile, their corollas broadly campanulate, with very short tube and 5 short teeth, densely pubescent especially on tube with many-celled clavate hairs; stamens 5, the anthers cordate-sagittate at base, the terminal appendages broadly ovate, obtuse; style branches short, acutish, unappendaged, merely papillose, the stigmatic lines extending nearly to apex; disk achenes obovoid-oblong, somewhat compressed, obtusely 4-angulate-ribbed, sometimes with a pair of additional weaker ribs on each face, subtruncate at apex, sparsely sessile-glandular, epappose.

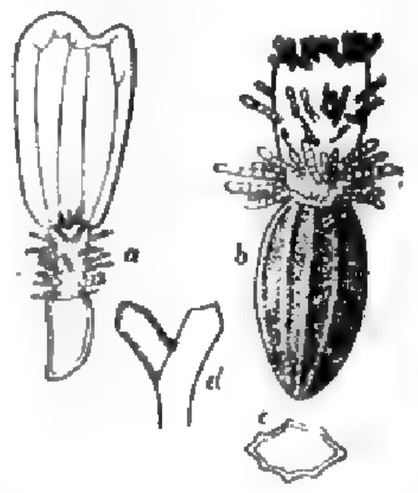

FIG. 87.—Details of *Trichocoryne connata*. *a*, Ray flower, scale 2.5; *b*, disk flower with mature achene, scale 5; *c*, cross-section of achene, scale 5; *d*, style branches, scale 10.

The relationship of this genus appears to be with *Galeana* Llave, from which it differs in its more numerous, flat phyllaries, its sterile rays, more numerous flowers, and obtusely quadrangular achenes, as well as in its narrow, entire, sessile, connate-based leaves. The generic name (from *θρίξ*, hair, and *κορύνη*, club) refers to the club-shaped hairs which thickly clothe the tube and teeth of the disk corollas.

Trichocoryne connata Blake, sp. nov. PLATE 62.

Erect single-stemmed perennial, 17 to 21.5 cm. high, from a slender whitish rootstock bearing many fibrous rootlets; stem simple or with few opposite branches, 1.5 to 2.5 mm. thick, greenish, appressed-hispidulous with blackish-based hairs, glabrescent below, denudate below except for the more or less persistent, scarious, sheathing bases of the leaves; leaves opposite, 11 to 13 pairs, spreading, linear or linear-lanceolate, 1.3 to 2.5 cm. long, 2 to 4.5 mm. wide, slightly narrowed at the subtruncate apex, connate at base into a subscarious sheath 2 mm. long, thickish, 3-nerved (the nerves impressed), equally green on both sides and densely impressed-punctate with shining olivaceous glands, sparsely hispidulous on costa beneath with appressed blackish-based hairs, otherwise glabrous; peduncles terminal, sometimes becoming pseudo-axillary, monocephalous, slender, slightly thickened below the head, densely pubescent like the stem, 1.5 to 4 cm. long, naked or with a single leafy bract; heads 1.1 to 1.5 cm. wide; disk subglobose, 4 to 5 mm. high, 6 to 8 mm. thick; involucre 3 mm. high, appressed, densely hispidulous-pilosulous with appressed, several-celled, blackish hairs and short-ciliate with several-celled clavellate hairs, the phyllaries 10, suborbicular or broadly cuneate-oval, broadly rounded, membranous-herbaceous with thinner, subhyaline margins, blackish green, plane, 3-veined, about 2.5 mm. wide; receptacle convex or low-conical, about 1.8 mm. high; rays 5 to 7, the tube 1.2 mm. long, densely pilose with several-celled, blunt, clavellate hairs, the lamina cuneate, 4.2 mm. long, 2.6 mm. wide, emarginate, 4-nerved, pubescent dorsally with subclavellate hairs; disk corollas densely pilose on tube and teeth with several-celled clavate hairs (the longer 0.6 mm. long), sparsely so on throat, 1.8 mm. long (tube 0.3 mm., throat 1.2 mm., teeth deltoid, acutish, 0.3 mm.); ray achenes inane, trigonous; disk achenes blackish, 2 mm. long, 1 to 1.2 mm. wide.

Type in the U. S. National Herbarium, no. 1,038,788, collected in the State of Durango, Mexico, altitude 1,000 meters, by P. Ibaña García (no. 450).

The ray flowers bear short, unequally bifid, abortive styles included in the tube, and the ovule is abortive. The tube bears at apex 3 or 4 short yellow-tipped lobes, possibly representing abortive stamens.

EXPLANATION OF PLATE 62.—*Trichocoryne connata*, from the type specimen. Natural size.

Hecubaea aptera Blake, sp. nov.

Herbaceous perennial; rootstock thick, short, with numerous somewhat thickened rootlets about 7 cm. long, bearing a single flowering stem and two tufts of leaves

leaves of the basal tufts elongate-oblanceolate, 23 to 30 cm. long (including petioles), 1.2 to 1.8 cm. wide, obtuse, entire, light green, glabrous, densely glandular-punctate, 1-nerved and featherveined (lateral veins about 3 pairs), the blade long-tapering into the shorter or subequal, basally ampliate and subscarious-margined petiole; stem erect, about 45 cm. high, monocephalous, striate, sparsely pubescent especially above with short, several-celled, spreading, blackish hairs, bearing chiefly below the middle 3 to 6 leaves, the lower similar to the basal leaves but smaller, about 15 cm. long, the uppermost linear or elliptic-linear, 1.5 to 2.5 cm. long, all sessile, not at all or only very obscurely decurrent, the uppermost pubescent beneath like the stem; head 4 cm. wide; disk 2 cm. wide, depressed-subglobose; involucre flattish, about 1.3 cm. long, 2-seriate, obgraduate, pubescent like the stem, the phyllaries herbaceous, linear or elliptic-linear, 1.5 to 4 mm. wide, obtuse or rounded, united at base; rays about 14, neutral, yellow, the lamina broadly cuneate, deeply 3 or 4-lobed, sometimes with a short inner lobe, pilose on back, 1.8 cm. long, 1.2 to 1.5 cm. wide; disk corollas yellow, pilose on teeth with several-celled hairs, 4.8 mm. long (tube 0.5 mm., teeth 1.2 mm.); ray achenes (immature) with a pappus of about 8 suborbicular or broadly ovate, rounded or acutish, denticulate squamellae about 0.5 mm. long; disk achenes (immature) glabrous, their pappus similar to that of the ray achenes but more lacerate.

Type in the U. S. National Herbarium, no. 1,038,786, collected in the State of Durango, Mexico, altitude 1,000 meters, by P. Ibaña García (no. 408).

From *Hecubaea scorzoneraefolia* DC., the only species of this genus hitherto known, *H. aptera* is distinguished by its nondecurrent leaves, its broader, obtuse or rounded phyllaries, its more prominent pappus, and its neutral ray flowers.

Dyssodia wootoni Blake, sp. nov.

Apparently annual, about 22 cm. high, branched from base, the branches procumbent or ascending, trichotomously branched; stem and branches slender, greenish, densely spreading-hirtellous, glabrescent, leafy; leaves opposite, sessile, broadly ovate in outline, 9 to 20 mm. long, 7 to 22 mm. wide, hirtellous, pinnatisect into 7 to 11 rather stiff, linear-filiform, aristate-tipped lobes 5 to 12 mm. long, about 0.3 mm. wide, somewhat narrower than the rachis; peduncles terminating stems and branches, monocephalous, glabrous or somewhat hirtellous below, erect, very slender, 7 to 10.5 cm. long, bearing several subulate, ciliate bracts about 2 mm. long; heads 12 mm. wide; disk subglobose, 5 to 6 mm. high, 6 to 8 mm. thick; involucre 5 mm. high, subtended by 5 lance-subulate, acuminate, ciliolate bracts 2 to 2.5 mm. long, the phyllaries 13, 2-seriate, equal, connate to middle (without decurrent margins), oblong, short-acuminate, short-ciliate on their free portions, otherwise glabrous, indurate-subherbaceous with thin subhyaline apex, this bearing 2 or 4 immersed elliptical glands; rays about 11, yellow, fertile, the tube sparsely hispidulous with several-celled subclavate hairs, the lamina oval, bidentate, 5-nerved, 4 mm. long, 2.3 mm. wide; disk corollas yellow, slender, similarly pubescent, 3 mm. long; achenes of ray and disk similar, obconic-linear, hispidulous, 2.2 mm. long; pappus of 5 obovate, obtuse, lacerate outer squamellae 1 to 1.2 mm. long, and 5 elliptic-oblong inner squamellae 2.5 to 2.8 mm. long, the latter with the body (1.5 mm. long) acutely 1-toothed on each side at apex, and the costa prolonged into an hispidulous awn equaling or somewhat shorter than the body; style branches obtuse, apiculate.

Type in the U. S. National Herbarium, no. 1012314, collected at Hacienda Buena Vista, about 20 miles east of Abasolo, Tamaulipas, Mexico, June 21, 1919, by E. O. Wooton.

This species belongs to the group of *Dyssodia* that by some authors is separated generically under the name *Thymophylla* (*Hymenatherum*). It is nearest *Dyssodia hartwegii* (A. Gray) Robinson, which has shorter peduncles, minutely pruinose-puberulent involucre, with the free margins of the phyllaries more finely ciliolate,

and shorter squamellae. The divisions of the leaves are decidedly rigid in the dried specimen, but Mr. Wooton informs me that they are not so when fresh.

Tagetes crassiceps Blake, sp. nov.

Frutescent; stem slender, branched, gray-barked, glabrous; branches sparsely incurved-puberulous or glabrous; leaves opposite, toward tips of branches alternate, pinnatisect, 3 to 5 cm. long, 2 to 3 cm. wide, the larger lobes 9 to 11, elliptic or oblong, 8 to 18 mm. long, 3 to 6 mm. wide, acute or obtuse, sharply serrate throughout with acute teeth, evenly glandular-punctate, glabrous or sparsely and obscurely pubescent beneath, the smaller basal lobes (1 to 3 pairs) 1.5 to 3.5 mm. long, aristate-toothed; peduncles monocephalous, 1 to 3 at apex of stem and branches, few-bracteate, glaucous, glabrous, 2 to 5.5 cm. long; disk 9 to 10 mm. high, 8 to 10 mm. thick; involucre subglobose-campanulate, glabrous except for the ciliolate teeth, 7 to 10 mm. high, 8 to 10 mm. thick, 8-toothed (teeth deltoid-acuminate, 1.5 to 2 mm. high, each with a double row of orbicular glands); rays 7, deep yellow, fertile, glabrous, the lamina oblong, bluntly 2-toothed, 17 mm. long, 8.5 cm. wide; disk flowers about 61, their corollas yellow, ciliolate with several-celled hairs on teeth, otherwise glabrous, 7.8 mm. long (tube 2.8 mm., throat cylindric-funnelform, 3.5 mm., teeth oblong, obtuse, 1.5 mm.); ray achenes linear, striate, glabrous, 4.8 mm. long, their pappus of 3 lanceolate, acuminate awns 1.8 to 2 mm. long and about 7 linear, acute or obtuse squamellae 1 mm. long or less, all free; disk achenes similar, 5 mm. long, the awns 1 to 3, 2 mm. long or less, the squamellae about 5, rhombic-lanceolate to linear, obtuse or acute, 1 mm. long or less.

Type in the U. S. National Herbarium, no. 1,023,340, collected in the vicinity of Cuenca, Ecuador, September 17 to 24, 1918, by J. N. Rose, A. Pachano, and G. Rose (no. 22859). Additional specimens, with the same data, were collected under no. 22852.

This species is well distinguished by its medium-sized, very broadly campanulate involucre, which is not at all contracted above.

SENECIONEAE.

Werneria articulata Blake, nom. nov.

Werneria lehmannii Hieron. Bot. Jahrb. Engler **28**: 647. 1901. Not *W. lehmannii* Klatt, Ann. Naturhist. Hofmus. Wien **9**: 368. 1894.

This species is apparently nearest *Werneria pygmaea* Hook. & Arn., differing in its articulate leaves with deciduous laminae. No specimens have been examined.

Werneria denticulata Blake, nom. nov.

Werneria brachypappus Phil. Anal. Univ. Chile **43**: 501. 1873. Not *W. brachypappa* Schultz Bip. Bonplandia **4**: 53. 1856.

This Chilean species, known to me only from description, is apparently nearest *Werneria cochlearis* Griseb. of Argentina. In the former the involucre is 14 to 16-fid with lanceolate, acute lobes; in the latter 8 to 12-fid, with oblong, obtuse lobes. *Werneria brachypappa* Schultz Bip. is listed in the Index Kewensis as a *nomen*, but is fully described on the page above cited.

MUTISIEAE.

Gochnatia boliviana Blake, sp. nov.

Shrub, 1 meter high; branches densely and closely griseous or ochroleucous-tomentulose; leaves alternate, usually with very short leafy branchlets in their axils; petioles 2 to 4 mm. long, ochroleucous-tomentulose; blades oval or oval-ovate to oblong, 1.8 to 3.8 cm. long, 1.1 to 1.8 cm. wide, acute to obtuse, mucronulate, at base rounded or subcordate, entire, subcoriaceous, above dull green, rather densely ochroleucous-tomentulose, glabrescent, beneath densely and closely ochroleucous-tomentulose, featherveined or somewhat triplinerved, the lateral veins 2 to 4 pairs, with the

secondaries closely prominulous-reticulate beneath, impressed above; heads solitary, terminal and in the upper axils, sessile, discoid, 42-flowered, broadly campanulate, 1.8 to 2.2 cm. high, 1.5 to 2 cm. thick; involucre about 7-seriate, strongly graduate, 12 to 13 mm. high, the outer phyllaries broadly ovate, acutish, passing gradually into the linear or lance-linear, acute innermost, all appressed, indurate, stiffly mucronate, densely ochroleucous-tomentulose, glabrescent in age; corollas "yellowish," glabrous, at maturity 13 mm. long (tube 6.5 mm., the limb parted almost to base into 5 equal, narrowly linear-lanceolate, apically somewhat thickened, recurved teeth about 6 mm. long); achenes densely subsericeous-pilose, 4.5 mm. long; pappus 9.5 mm. long, brownish-tinged, of numerous, graduate, very narrowly linear paleae, the innermost longest, bent and slightly thickened toward apex; anther tails 2.2 mm. long, ciliate, broadened at apex; style branches erect, 1.2 mm. long.

Type in the U. S. National Herbarium, no. 701956, collected at Santa Cruz, Bolivia, altitude 1,600 meters, May, 1892, by Otto Kuntze.

The type material was orginally identified and recorded[21] by Kuntze as *Gochnatia curviflora* (Griseb.) O. Hoffm. In that Argentinian species the heads are short-pedicelled and only 12 to 18-flowered, the leaves are oblong-lanceolate and repand, the involucre is 10 mm. high, and its phyllaries are white-tomentose.

Gochnatia obtusata Blake, sp. nov.

Much branched shrub, up to 2.6 meters high; branchlets densely cinereous-tomentose; older branches and stem glabrescent; leaves alternate; petioles cinereous-tomentose, 0.5 to 2.5 mm. long; blades oval, 4.5 to 20 mm. long, 3 to 13 mm. wide, broadly rounded to obtuse, sometimes emarginate or apiculate, at base rounded, entire, coriaceous, obscurely if at all revolute-margined, above deep green, thinly puberulous-tomentulose, in age glabrate and shining except along costa, beneath densely and closely cinereous-tomentose, featherveined, the lateral veins about 4 pairs, somewhat prominulous and reticulate beneath; heads discoid, 6-flowered, 11 to 13 mm. high, glomerate at tips of branches and in clusters of 1 to several in the subterminal axils, the pedicels densely scaly-bracted, 2 mm. long or less; involucre (excluding the minute bracts which cover the pedicels) 6 to 8 mm. high, about 6-seriate, strongly graduate, subcylindric, the phyllaries ovate, acute to (inner) sharply acuminate, indurate and whitish throughout, or brown-tinged above, arachnoid-ciliate or -ciliolate, glabrous on back; corollas in the dried state pale (doubtless whitish or ochroleucous when fresh), glabrous, 8 mm. long (tube 3 mm., the limb parted to base into 5 linear-lanceolate, apically thickened, recurved teeth 5 mm. long); achenes oblong, somewhat compressed, densely erect-pilose, 4.5 mm. long; pappus 7 mm. long, of numerous, graduate, very slender, minutely hispidulous awns; anther tails 2 mm. long; style branches 0.5 to 0.7 mm. long.

Type in the U. S. National Herbarium, no. 254705, collected on dry limestone hills at Tehuacan, Puebla, Mexico, altitude 1,675 meters, December 20, 1895, by C. G. Pringle (no. 6253).

ADDITIONAL SPECIMENS EXAMINED:

PUEBLA: Tehuacan, January, 1904, *Purpus* 482. Vicinity of Tehuacan, August 31, 1906, *Rose & Rose* 11225.

OAXACA: Near Huajuapam, altitude 1,705 to 1,980 meters, November 16, 1894, *Nelson* 1967.

Hitherto confused with *Gochnatia hypoleuca* (DC.) A. Gray, which ranges from Texas to Querétaro. In that plant the leaves are chiefly elliptic, acute or acutish, and mucronate, 2 to 5 cm. long, 0.8 to 1.5 cm. wide; the style branches are 0.7 to 1 mm. long; the involucre is only 5 to 6 mm. long, and its phyllaries range from obtuse to acute or obtusely acuminate.

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[21] Kuntze, Rev. Gen. Pl. 3[2]: 155. 1898.

Gochnatia viscosissima (Kuntze) Blake.

Gochnatia glutinosa α viscosissima Kuntze, Rev. Gen. Pl. **3**[2]: 155. 1898.

This plant, represented in the National Herbarium by specimens of the type collection (Paso Cruz, latitude 34° S., Argentina, altitude 1,500 meters, 1892, *Kuntze*), appears to be well distinguished specifically by its foliar characters. Its leaves are elliptic or linear-elliptic, 12 to 22 mm. long, 2 to 5 mm. wide, uncinate-cuspidate at apex, entire, veiny beneath, and very strongly vernicose-resinous, like all the younger parts of the plant. The branchlets are hispidulous.

Lycoseris trinervis (D. Don) Blake.

Diazeuxis trinervis D. Don, Trans. Linn. Soc. **16**: 253. 1830.

This species, originally based on material from Guayaquil, has been re-collected by Rose, Pachano, and Rose (no. 23604) at Durán, Ecuador, near Guayaquil. It is related to *Lycoseris bracteata* Benth.

Proustia cuneata Blake, sp. nov. PLATE 63.

Much-branched, unarmed shrub; branchlets whitish, rather densely crisped-tomentulose with griseous hairs, glabrescent; stem and older branches gray-barked, glabrous; leaves alternate; petioles 1 to 2 mm. long; blades cuneate or cuneate-oblanceolate, 1.2 to 2.5 cm. long, 4 to 8 mm. wide, obtuse or rounded, spinose-mucronate, cuneate to base, broadest near the apex, repand-denticulate mostly above the middle with about 8 pairs of spinose teeth, coriaceous, above light bright green, inconspicuously tomentulose and viscidulous, glabrescent, densely prominulous-reticulate, beneath densely cinereous-tomentulose, the veins mostly concealed by the tomentum; heads 5 or 6-flowered, homogamous, 8 to (fruit) 10 mm. high, 4 to (fruit) 10 mm. thick, oblong-cylindric becoming turbinate-subglobose, in close clusters of 3 or 4 at tips of branches, sessile or on pedicels 3 mm. long or less; involucre about 4-seriate, graduate, 7 to 8 mm. high, the phyllaries comparatively few (about 14), the outermost broadly ovate, acute or acutish, stiffly mucronate, somewhat tomentulous, the middle ones oblong or oval, obtuse, mucronate, ciliolate and somewhat arachnoid-ciliate, the innermost oblong-elliptic, mucronulate, pubescent like the middle ones, all appressed, indurate, greenish white, with thinner, brownish or purplish-tinged, somewhat glandular apex; corollas white, glabrous, 2-labiate, 7.5 mm. long, one lip unequally 3-toothed about to middle, the other 2-parted essentially to base, the teeth all recurved above; achenes 5-angled, stipitate-glandular and sparsely hispidulous, 3 mm. long; pappus 5.5 mm. long, brownish, of about 45 very narrowly linear hispidulous awns, at apex slightly thickened and subplumose-barbellate; stamen tails linear, 1 mm. long; style branches erect, rounded, minutely papillose, 1.5 mm. long.

Type in the U. S National Herbarium, no. 603741, collected at Ollantaytambo, Peru, altitude about 3,000 meters, May 4, 1915, by O. F. Cook and G. B. Gilbert (no. 538)

The vernacular name of this species is "huamanpeta." It is nearest *P. baccharoides* D. Don., which has much larger leaves (5 to 10 cm. long) and 2 to 4-flowered heads with shorter involucre (4 mm. long).

EXPLANATION OF PLATE 63.—*Proustia cuneata*, from the type specimen. Natural size.

Perezia wislizeni minor Blake, subsp. nov.

Involucre about 6-seriate, closely graduate, about 1.3 cm. high, 1.5 to 2.2 cm. thick, the phyllaries oval to (inner) oblong-obovate, the outer indurate-herbaceous, acute or acuminate, mucronate, the inner with minutely ciliolate, thinner margins and rather abruptly acuminate spreading tips, all densely many-nerved, the inner purplish-tinged.

Type in the U. S. National Herbarium, no. 1038784, collected in the State of Durango, Mexico, altitude 1,000 meters, by P. Ibaña García (no. 376).

In typical *Perezia wislizeni*, from which var. *megacephala* A. Gray can not be separated, the heads are considerably larger, the involucre being 2 to 4 cm. high.

Trixis peninsularis Blake, sp. nov.

Shrubby, divaricately branched above; stem whitish-barked, glabrous; branchlets in youth densely and cinereously subtomentose-pilose with loosely spreading to erectish hairs with subtuberculate bases, glabrescent and brownish when older; leaves alternate; petioles broad, 2 to 4 mm. long, not auriculate or decurrent, densely subsericeous-pilose; blades lanceolate or lance-elliptic, 4 to 8 cm. long, 0.8 to 2 em. wide, acuminate to a very acute apex, somewhat falcate, at base rounded to cunate, serrulate with small, acute, callous teeth, usually strongly revolute-margined, papery, above light green, rather densely short-pilose, beneath densely and softly sericeous-pilose with antrorse hairs, featherveined, the lateral veins about 8 pairs, impressed above, whitish and prominulous beneath and with the secondaries loosely reticulate; heads about 1.8 cm. wide, about 14-flowered, homogamous, numerous, cymose-panicled on the divergent leafy-bracted branches of the inflorescence, the pedicels usually bracteate, 6 to 17 mm. long; disk subcylindric, in flower 16 mm. high, 6 mm. thick, in fruit about 18 mm. high; involucre double, the outer phyllaries 4, linear-oblanceolate or linear-elliptic, 6 to 9 mm. long, 1 to 2 mm. wide, acuminate, herbaceous, 1-nerved and with a pair of weaker veins, hispid-pilose and ciliate and more sparsely stipitate-glandular; inner phyllaries 8, linear, 11 to 12 mm. long, acute or acuminate, subherbaceous, evenly but not densely stipitate-glandular and hispid-pilose, densely ciliolate or ciliate above; outer flowers yellow, bilabiate, glabrous, the tube 7.5 mm. long, the outer lip oblong, tridentate, 7 mm. long, 2.6 mm. wide, the inner lip 2-parted, 6 mm. long, the lobes revolute; inner corollas similar in general but smaller, the outer lip unequally 3-toothed; achenes very slenderly subcylindric' 6 to 8 mm. long, densely papillose-hispidulous with 1-celled hairs; pappus of numerous, minutely hispidulous, straw-colored setae 1 cm. long.

Type in the U. S. National Herbarium, no. 638508, collected at San Josǫ del Cabo, Baja California, Mexico, March 25, 1911, by J. N. Rose (no. 16457).

ADDITIONAL SPECIMENS EXAMINED:

BAJA CALIFORNIA: San José del Cabo, March 8, 1892, *Brandegee* 347. La Paz, January to February, 1890, *Palmer* 7.

All these specimens have been identified as *Trixis angustifolia* DC. or *T. haenkei* Schultz Bip. Palmer's plant was recorded under the former name by Vasey and Rose,[22] and under the latter in Robinson and Greenman's revision[23] of the Mexican and Central American species of the genus. The plant is nearest *T. haenkei*, but that species, originally described from the Sierra Madre of northwestern Mexico, differs in its densely silky-pubescent involucre.

Trixis adenolepis Blake, sp. nov.

Shrub, 2 meters high; branches rather densely pilose with erectish hairs with small tuberculate bases, the stem glabrescent, gray-barked; leaves alternate; petioles 2 to 3 mm. long, narrowly margined, pubescent like the branches, usually with small densely ochroleucous-sericeous buds in their axils; blades elliptic, those of the main stem 5.5 to 7.5 cm. long, 1.7 to 2.4 cm. wide, acuminate to a sharp point, at base acutely cuneate, entire or rarely with a few small acute teeth above, not revolute-margined, papery, above rather harshly hispid-pilose with ascending hairs with small tuberculate bases, more densely so along costa and margins, glabrescent, beneath scarcely lighter green, evenly and rather densely pilose with loosely ascending or spreading hairs with slightly thickened conical bases, featherveined, the lateral veins about 7 pairs, barely prominulous beneath, the secondaries obscure; heads about 1.8 cm. wide, numerous, 13-flowered, homogamous, cymose-panicled toward tips of stem and branches, the inflorescences leafy-bracted, the pedicels 1 to 10 mm. long; disk in flower subcylindric, 1.8 cm. high, 6 mm. thick; involucre double, the outer phyllaries 5,

[22] Contr. U. S. Nat. Herb. **1**: 73. 1890. [23] Proc. Amer. Acad. **40**: 10, 1904.

linear-subulate or lance-linear, acuminate, revolute-margined, stipitate-glandular and short-pilose, herbaceous, 11 to 13 mm. long, 1 to 2 mm. wide; inner phyllaries 8, linear, acuminate, subherbaceous, densely stipitate-glandular, densely ciliolate, toward apex pilose, 15 to 16 mm. long; outer corollas yellow, bilabiate, the tube sparsely stipitate-glandular above, 8 mm. long, the outer lip oblong-ovate, 8 mm. long, 3 mm. wide, tridentate, stipitate-glandular on back and near apex short-pilose, the inner lip 2-parted, 5.5 mm. long, the lance-linear lobes recurved; inner corollas similar but smaller; achenes very slenderly fusiform-cylindric, 7 mm. long, densely papillose-hispidulous with spreading, yellowish, 1-celled hairs; pappus of numerous, very slender, hispidulous, straw-colored setae 1 cm. long.

Type in the U. S. National Herbarium, no. 576968, collected at Gualán, Guatemala, altitude about 125 meters, January 12, 1905, by C. C. Deam (no. 324).

The type collection has been identified as *Trixis frutescens* P. Br., which is *T. radialis* (L.) Kuntze. It differs from that species in pubescence and various other characters. It is nearest *T. rugulosa* Robins. & Greenm., but is distinguished by its longer and narrower outer and longer, densely stipitate-glandular inner phyllaries.

Trixis grandis Blake, sp. nov.

Herb 2 meters high, branched at least above; stem stout, fistulose, 1 cm. thick, densely accumbent-pilosulous with sordid glandular-based hairs, winged by the long-decurrent leaf bases, the wings 1 to 5 mm. wide; stem leaves rather remote, elliptic-lanceolate or oblong-lanceolate, 20 to 30 cm. long, 3.5 to 4 cm. wide, acute, sessile by a scarcely narrowed, decurrent base, remotely denticulate, papery, dark dull green, rather densely pilosulous on both sides with spreading or ascending glandular-based hairs, featherveined, loosely prominulous-reticulate beneath; branch leaves much smaller, 3 to 7.5 cm. long; heads subglobose, about 76-flowered, 3 cm. wide and 1.8 cm. high in flower, 3.5 to 4 cm. wide in fruit, in loose panicles of about 8 toward end of branches, the peduncles swollen above, monocephalous, 4 to 8 cm. long; involucre distinctly 2-seriate, equal, 1 to 1.2 cm. high, densely accumbent-pilosulous, the outer phyllaries about 7, oblanceolate or linear-oblong, acute, usually denticulate toward apex, 1.5 to 2.8 mm. wide, the inner about 18 to 21, linear, acuminate, about 1.5 mm. wide; corollas "orange-red," bilabiate, 1.4 cm. long, hirsute toward apex of tube and on the back of both lips above, the outer lip elliptic-oblong, tridenticulate, 6.5 mm. long, the inner 2-parted, 5 mm. long; achenes distinctly rostrate, 9 to 12 mm. long, densely spreading-pilosulous with slender subglandular-based hairs; pappus brownish, 8 to 10 mm. long.

Type in the U. S. National Herbarium, no. 1,110,858, collected in swamps at Novo Friburgo, State of Rio de Janeiro, Brazil, altitude 900 meters, January 7, 1922, by E. W. D. and M. M. Holway (no. 1470).

Allied to *Trixis glaziovii* Baker and *T. gigas* Wawra. The former, according to Baker's description, has much smaller leaves, 30-flowered heads, and achenes only 5 mm. long. The latter, while agreeing in general features with *T. grandis*, has leaves flavescent-villous beneath, an involucre 2.5 cm. high or more, and achenes only 5 mm. long and not distinctly rostrate.

Trixis verbascifolia (Gardn.) Blake.

Bowmania verbascifolia Gardn. in Hook. Icon. Pl. 6: *pl. 519, 520*. 1843.

Trixis bowmanii Baker in Mart. Fl. Bras. 6^3: 390. 1884.

A specimen of the type collection, *Gardner* 5797, is now in the National Herbarium.

CICHORIEAE.

Pinaropappus parvus Blake, sp. nov.

Dwarf perennial, about 4 cm. high; caudex short, with short thick branches (3 to 4 mm. thick), bearing rosettes of leaves and 1 to 4 scapes; scapes very slender, curved glabrous, pale green, naked or bearing 1 to 4 subulate bracts 1 to 4 mm. long, rarely

with a branch below the middle; leaves densely rosulate, narrowly oblanceolate or spatulate-oblanceolate, 5 to 15 mm. long, 1 to 2 mm. wide, acute, callous-apiculate, narrowed gradually into a petioliform base, minutely serrulate, subcoriaceous, pale green or glaucescent, glabrous; heads solitary, about 12 mm. wide; involucre campanulate, about 5-seriate, graduate, the outermost phyllaries very short, triangular or lance-ovate, the others narrowly linear-oblong or linear-lanceolate, all acute or acutish to obtusish, submembranous, with purplish center and narrower whitish margins, without sphacelate tips or these minute, obscurely ciliolate at apex; receptacle paleaceous, the pales membranous, subulate-attenuate, glabrous, 7 mm. long; lamina of the corollas about 8 mm. long; achenes (immature) contracted above, glabrous, about 4-angled; pappus of unequal hispidulous bristles, about 3 mm. long.

Type in the U. S. National Herbarium, no. 1,120,372, collected on rocks, Hilton Canyon, Lincoln National Forest, New Mexico, altitude 2,075 meters, September 12, 1916, by W. R. Chapline (no. 660).

Distinguished from its closest relative, *Pinaropappus spathulatus* T. S. Brandeg.,[24] of Veracruz and Puebla, by its lower growth, thick short-branched caudex, smaller and somewhat firmer leaves, and lack of obvious sphacelate tips to the phyllaries. Comparison of *Purpus* 1165, the type collection of *P. spathulatus*, which has been ent from the Gray Herbarium, with *Purpus* 5816, type collection of *P. caespitosus* T. S. Brandeg., [25] in the National Herbarium, has shown that the two supposed species are identical and should be combined under the name *P. spathulatus*.

Malacothrix floccifera (DC.) Blake.

Senecio flocciferus DC. Prodr. **6**: 426. 1837.

Malacothrix obtusa Benth. Pl. Hartw. 321. 1849.

DeCandolle's description of *Senecio flocciferus*, which was evidently based on imperfect material, agrees well with *Malacothrix obtusa*, and his name is referred to the synonymy of that species by Gray. As this was not a homonym, it is necessary to adopt it in place of *Malacothrix obtusa* Benth.

Hieracium arsenei Blake, sp. nov.

Herbaceous perennial, 1-stemmed, about 23 cm. high; caudex short, oblique, with long somewhat thickened rootlets, at apex densely tufted-pilose with golden-brown hairs about 15 mm. long; basal leaves few (about 2), obovate-oval, short-petioled, about 2.5 cm. long, 1.2 cm. wide, rounded, glandular-apiculate, remotely glandular-serrulate, thickish, purple beneath, rather densely hirsute-pilose above with golden-brown hairs about 4 mm. long and with obscurely tuberculate bases, sparsely so beneath; stem slender, densely pilose for about one-quarter its length with golden-brown hairs (4 to10 mm. long) with small tuberculate bases, sparsely so above and there slightly stipitate-glandular, simple below the inflorescence, bearing 2 to 4 linear-subulate densely pilose bracts (7 to 12 mm. long, 1 mm. wide or less); heads several, about 27-flowered, in a thyrsiform panicle 9 cm. long or less, this densely stipitate-glandular (the glands golden, the hairs yellowish or blackish-based, about 0.5 mm. long) and very sparsely or rather densely pilose with long yellow hairs; involucre 9.5 to 12.5 mm. high, 4 to (young fruit) 9 mm. thick, the chief phyllaries 13, linear lanceolate, blackish green, rather densely stipitate-glandular especially below, and loosely long-pilose with yellowish hairs about 2.5 mm. long, the outer phyllaries or bracteoles few, half as long as the inner or less; corollas yellow (when dry); achenes bright reddish brown or purplish brown, narrowed at base, slightly attenuate at apex, striate, 3.5 to 4.6 mm. long; pappus somewhat sordid, 5 mm. long.

Type in the U. S. National Herbarium, no. 42962, collected at Cerro Azul, near Morelia, Michoacán, Mexico, March 9, 1911, by G. Arsène.

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[24] Zoe **5**: 241. 1906.

[25] Univ. Calif. Publ. Bot. **4**: 388. 1913.

A very distinct species, characterized by its slender habit, dense basal tuft of golden-brown hairs, small basal leaves, merely bracteate stem, and comparatively large achene. It is apparently nearest *H. junceum* Fries, a little known Mexican species, of which no specimens have been examined by the writer. This is said to have flocculent-pubescent pedicels, densely floccose, epilose involucre (only 5.5 to 7 mm. high), and reddish pappus. In general appearance *H. arsenei* is similar to *H. mexicanum* Less., but in that the achenes are only 2 to 3 mm. long.

Hieracium nicolasii Blake, sp. nov.

Herbaceous perennial, single-stemmed, 35 to 55 cm. high; rootstock short, oblique, with fibrous rootlets; basal leaves few or wanting at flowering time, obovate or oblanceolate, 10 cm. long (including the margined petiole) and 2 cm. wide, or smaller, rounded to acutish, cuneate at base, remotely glandular-denticulate, sparsely or rather densely hirsute-pilose with pale brownish hairs about 3 mm. long with scarcely tuberculate bases; stem rather densely setose for most of its length with spreading brownish hairs 3.5 mm. long, with scarcely tuberculate bases, and above toward and in the inflorescence very densely stipitate-glandular (hairs spreading, blackish below, yellow above like the glands, several-celled, mostly about 0.6 mm. long), somewhat pilosulous, and sparsely or rather densely setose with long hairs similar to those of the stem below but usually blackish; stem leafy to middle or above, the leaves 5 to 8, the middle and lower ones obovate or oblanceolate, 6 to 9.5 cm. long, 1 to 2 cm. wide, acutish to acute or subacuminate, narrowed to a sometimes clasping base, remotely glandular-denticulate, pubescent like the basal leaves, the uppermost smaller, lanceolate or elliptic-lanceolate, about 3 cm. long; heads medium-sized, about 5 to 7 in a close terminal cyme or cymose panicle, about 57-flowered, the pedicels 6 mm. long or less, densely pubescent like the upper part of the stem; involucre 9 to 13 mm. high, 5 to (young fruit) 12 mm. thick, the principal phyllaries about 19, linear-lanceolate, blackish green, densely stipitate-glandular below (hairs blackish below, yellowish above like the glands, 1.5 mm. long or less), less densely so above, and sometimes sparsely pilosulous at base or along midline, the outer phyllaries or bracteoles few, two thirds as long as the inner or less; corollas greenish yellow (when dry), the lamina 4.8 mm. long, shorter than the tube, the styles pale; achenes very gradually tapering above, deep purplish brown, striate, glabrous, 4 to 4.3 mm. long; pappus sordid-whitish, 6 mm. long.

Type in the U. S. National Herbarium, no. 42961, collected at Cholulá, vicinity of Puebla, Puebla, Mexico, July 14, 1910, by Brother Nicolas (distr. Arsène no. 5252).

Hieracium nicolasii is related to *H. prionobium* Robins. & Greenm. and *H. crepidispermum* Fries. From the former it differs in its broader (oblanceolate or obovate) stem leaves, from the latter in its densely stipitate-glandular involucre and sordid pappus.

Hieracium jaliscopolum Blake, sp. nov.

Herbaceous perennial, 35 to 60 cm. high, about 3-stemmed; rootstock thick, oblique, about 2.5 cm. long; basal leaves essentially absent at flowering time; stem rather slender, leafy below the middle, with few linear bracts above, simple below the inflorescence or few-branched near base, sparsely or densely hirsute-pilose about to middle with spreading or reflexed rufid hairs (1.5 to 4 mm. long, with small tuberculate bases), above the middle rather sparsely stipitate-glandular with blackish hairs (about 0.5 mm. long) bearing yellowish glands; lower stem leaves about 5 to 8, rather crowded, elliptic to elliptic-oblanceolate, the larger sessile and somewhat clasping or the lower petiolate, 5 to 17 cm. long, 1.3 to 2.3 cm. wide, acuminate, apiculate, narrowed to base, pale and glaucescent, ciliate and hirsute-pilose like the stem or sometimes nearly glabrous beneath; heads several or rather numerous, loosely paniculed, medium-sized, about 53-flowered, the pedicels densely stipitate-glandular like the upper part of the stem, sometimes slightly tomentulose at apex, 1.5 to 4 cm. long; involucre 8 to 9.5 mm. high, 5 to (fruit) 12 mm. wide, the chief phyllaries 21, linear

lanceolate, blackish green, rather densely stipitate-glandular (hairs blackish, 0.5 to 0.8 mm. long, the glands yellow) and toward base sparsely pilosulous, the outer phyllaries or bracteoles few, half as long as the proper phyllaries or less; corollas not well seen; achenes columnar, contracted at base, not narrowed above, deep purplish brown or almost black, ribbed, minutely hispidulous on the ribs, 2.5 to 3 mm. long; pappus somewhat sordid, about 5 mm. long.

Type in the U. S. National Herbarium, no. 301606, collected near Colotlán, Jalisco, Mexico, August 29, 1897, by J. N. Rose (no. 2680).

ADDITIONAL SPECIMEN EXAMINED:

JALISCO: Road between Huejuquilla and Mesquitac, August 25, 1897, *Rose*.

Hieracium jaliscopolum is nearest *H. wrightii* (A. Gray) Robins. & Greenm., differing chiefly in the character of its pubescence. In that species the long rufid hairs of the stem extend to the inflorescence, without the short dark gland-tipped hairs that occur on the upper half of the stem in *H. jaliscopolum*, and the pedicels are densely to rather sparsely tomentulose, as well as stipitate-glandular. The vernacular name of Rose's no. 2680 is given as "lechugilla."

Hieracium abscissum morelosanum Blake, subsp. nov.

Herbaceous perennial, about 1 meter high, similar to *H. abscissum*; stem pilose on the lower third with rufidulous hairs with small, tuberculate, blackish bases, very sparsely so toward the middle, glabrous above; inflorescence thyrsoidal, up to 60 cm. long, many-headed, the pedicels 1.3 to 2.4 cm. long, sparsely stipitate-glandular toward apex (the glands yellowish, the hairs sometimes blackish-based), very sparsely so or glabrous below, quite without tomentum; involucre 6 to 7 mm. high, rather densely stipitate-glandular at base (glands yellowish, the hairs 0.5 mm. long or less, sometimes blackish below), sparsely so along midline above; achenes columnar, slightly narrowed at base, reddish brown, minutely hispidulous on the ribs, 2 to 2.2 mm. long; pappus sordid, rather sparse, 4 mm. long.

Type in the U. S. National Herbarium, no. 342756, collected in mountain woods above Cuernavaca, Morelos, Mexico, altitude 2,285 meters, February 5, 1899, by C. G. Pringle (no. 8053).

The type collection has been recorded by Robinson and Greenman [26] as *Hieracium abscissum* Less. From the abundant material of that species examined it differs in the entire absence of tomentulose indument on the pedicels and involucre.

Hieracium panámense Blake, sp. nov.

Herbaceous perennial, single-stemmed, about 90 cm. high; rootstock short, thick, emitting very numerous rootlets 15 cm. long or more; basal leaves 12 or more, obovate, 6 to 11 cm. long (including the very short, margined petiole), 2.5 to 3.5 cm. wide, broadly rounded and sometimes emarginulate, cuneate at base, obscurely glandular-denticulate or slightly repand, thin, hirsute-pilose and ciliate with rufidulous, etuberculate hairs 3 to 7.5 mm. long, beneath lighter green and often more sparsely pubescent; stem stoutish, branched from near the middle, sparsely hirsute-pilose to middle with rufidulous hairs about 3 mm. long, rather sparsely pilosulous throughout with loosely accumbent whitish hairs; stem leaves about 8, similar to the basal leaves, sessile, scarcely or not clasping, 6 to 11 cm. long, 2 to 3.5 cm. wide; inflorescence loosely thyrsoid-paniculate, about 40 cm. long, many-headed, the branches and pedicels densely subtomentulous-pilosulous with subappressed griseous hairs and rather densely stipitate-glandular with yellowish glands, the pedicels 4 to 16 mm. long; heads small, 31-flowered; involucre 7 to 8 mm. high, about 4 mm. thick in flower, the phyllaries 13, linear-lanceolate, light green, toward base sparsely pilosulous and stipitate-glandular with yellowish glands (about 0.3 mm. long including stipe), above the middle sparsely pilosulous along midline or subglabrous, the bractlets few, 2.5 mm. long or less; corollas apparently pale yellow, the lamina about 4 mm.

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[26] Proc. Amer. Acad. 40: 21. 1904.

long, equaling the tube, the styles pale; achenes (immature) columnar, scarcely narrowed at either end, pale, glabrous, 1.2 mm. long; pappus straw-color, 4.5 mm. long.

Type in the U. S. National Herbarium, no. 1,083,884, collected near Alhajuela, Panama, April, 1911, by August Busck (no. 1).

This species is nearest *Hieracium abscissum* Less., but is very distinct in its broadly rounded basal leaves.

Hieracium melanochryseum Blake, sp. nov.

Herbaceous perennial, 2-stemmed, about 16 cm. high, from a short caudex; basal leaves several, elliptic or elliptic-obovate, 5 to 8 cm. long (including the short margined petiole), 1.5 to 2 cm. wide, acute or obtusish, cuneate at base, sparsely glandular-denticulate or subentire, pale green, thin-papery, hirsute-pilose on both sides and ciliate, the hairs rufidulous, slightly thickened below, not tuberculate; stem densely spreading-hirsute-pilose like the leaves (the hairs with conical blackish bases), and chiefly above densely stipitate-glandular (the glands yellow, the hairs blackish, 1 mm. long or less) and sordid-tomentulous; stem leaves 2 or 3, the lower similar to the basal leaves, scarcely clasping, the uppermost much smaller; heads rather large, about 56-flowered, about 7, approximate, the pedicels pubescent like the upper part of the stem, 7 mm. long or less; involucre 1 to 1.2 cm. high, 7 to (fruit) 12 mm. thick, the phyllaries about 19, linear-lanceolate, blackish green with paler margins, densely pubescent at base like the pedicels, above similarly pubescent along midline, the inner nearly glabrous, the outer phyllaries or bracteoles few, half as long as the proper phyllaries or less; corollas apparently pale yellow, the lamina 4.5 mm. long, shorter than the tube, the styles dark; achenes columnar, striate, deep reddish brown, glabrous, 3.8 mm. long; pappus sordid, rather copious, 8 mm. long.

Type in the U. S. National Herbarium, no. 450229, collected between Pachua and Real del Monte, Hidalgo, Mexico, August 31, 1903, by J. N. Rose and J. H. Painter (no. 6673).

Perhaps nearest *Hieracium bulbisetum* Arv.-Touv.,[27] but distinguished by its much larger heads and achenes.

Hieracium comaticeps Blake, sp. nov.

Herbaceous perennial, 15 to 35 cm. high, single-stemmed, from an oblique rootstock up to 3.5 cm. long; leaves chiefly or entirely basal, several, obovate or elliptic-oblanceolate, 5 to 9 cm. long (including the slender or broad, 0.5 to 3.5 cm. long petiole), 1 to 2.3 cm. wide, acute or obtuse, glandular-apiculate, cuneate at base, remotely glandular-denticulate, papery, often purplish-tinged, loosely pilose and ciliate with pale rufid, etuberculate hairs about 2 mm. long; stem slender, simple, rather densely cinereous-tomentulose especially above, more sparsely pilosulous especially below with blackish several-celled hairs, and very sparsely hirsute-pilose with dark hairs about 2 to 5 mm. long, in age glabrescent below; stem leaves none to 2, oblanceolate, the lower similar to the smaller basal leaves, the upper oblanceolate, about 3.5 cm. long, 5 mm. wide, petioled; head 1 to 7, medium-sized or (if solitary) rather large, approximate, the pedicels 1.3 cm. long or less, densely sordid-tomentulose and less densely pilose with blackish hairs 1.5 to 3 mm. long, about 34 to (when solitary) 64-flowered; involucre 9 to 12 mm. high, 6 to (fruit) 15 mm. thick, very densely and loosely sublanate-pilose (the hairs blackish below, griseous above, 4 to 7 mm. long), and beneath the hairs minutely and densely black-papillose, rarely with a very few short gland-tipped hairs intermixed, the chief phyllaries 13 to 20, blackish green,

[27] HIERACIUM BULBISETUM Arv.-Touv. Ann. Cons. Jard. Genève **3**: 27. 1899. *Hieracium oaxacanum* Robins. & Greenm. Proc. Amer. Acad. **40**: 21. 1904; Zahn in Engler, Pflanzenreich **4**[280]: 1106. 1922.
Both these specific names are based on the same type, *Pringle* 4715.

the outer phyllaries or bracteoles few, about half as long as the proper phyllaries, or less; corollas apparently whitish (when dry), the lamina 5 mm. long, exceeding the tube, the styles rather dark; achenes columnar, short-tapering at base, not contracted above, reddish or purplish-brown, minutely hispidulous on the ribs, 2 to 2.5 mm. long, about 10-ribbed and with 5 of the ribs somewhat more prominent than the others; pappus sordid-whitish or brownish, about 6 mm. long.

Type in the U. S. National Herbarium, no. 570623, collected on wet rocks near timber line, Mount Ixtaccihuatl, State of Mexico, Mexico, October, 1905, by C. A. Purpus (no. 1829).

The type collection was distributed as *Hieracium mexicanum* Less. *Hiracium comaticeps* is nearest that species, but differs specifically in its densely long-pilose heads, which are similar in pubescence to those of some South American species of the genus, such as *H. frigidum* Wedd.

Hieracium maxonii Blake, sp. nov.

Herbaceous perennial, 25 cm. high or less, erect, single-stemmed; rootstock apparently short and erectish, densely silky-pilose above with rufous hairs about 1 cm. long; basal leaves several, oblanceolate, obtuse, bluntly apiculate, acuminate at base, mucronulate-denticulate or repand-denticulate with 10 to 15 pairs of unequal obtusely gland-tipped teeth 0.3 to 0.8 mm. high, often purplish-tinged, rufid or whitish-pilose particularly toward margin and on costa beneath, somewhat stipitate-glandular especially on costa beneath, the petiole 2 to 8.5 cm. long, marginate above, the blade 7.5 to 10.5 cm. long, 1 to 1.5 cm. wide; stem slender, purplish, simple below the inflorescence, densely rufid-pilose on the lower third with spreading hairs about 5 mm. long, sparsely or rather densely stipitate-glandular throughout with very short hairs, bearing about 4 leaves in the lower half and 1 or 2 reduced ones above the middle, the lower ones similar to the basal leaves but smaller and usually sessile, 4 to 12 cm. long, 3 to 10 mm. wide, the upper linear or linear-lanceolate, 2.2 to 3.5 cm. long, 1 to 3 mm. wide; heads about 7, about 31-flowered, approximate, at first glomerate, the lowest one subremote, the pedicels densely and sordidly subtomentulose and stipitate-glandular, 11 mm. long or less at maturity; involucre 7 to 9.5 mm. high, 5 to (submaturity) 12 mm. wide, bracteolate at base, the bracteoles 2-seriate, lanceolate, acuminate, about 3 mm. long, sordid-pilosulous and sparsely stipitate-glandular, the proper phyllaries about 18, linear-lanceolate, acuminate to an obtusish apex, greenish with blackish costa, sparsely pilosulous with whitish and blackish hairs and sparsely stipitate-glandular with yellowish glands, somewhat graduate, a few of the outer only half or two-thirds as long as the inner; corollas yellow, the lamina 4.5 mm. long, equaling the tube, the styles dark (when dried); achenes subcylindric, 2.8 to 3 mm. long, slightly narrowed toward base, not narrowed at apex, striate, obscurely hispidulous on the ribs, bright reddish brown; pappus nearly straw-color, rather sparse, 5 mm. long.

Type in the U. S. National Herbarium, no. 675708, collected on an open rocky slope, summit of Chiriquí Volcano, Panama, altitude 3,374 meters, March 12, 1911, by William R. Maxon (no. 5351).

Nearest *Hieracium irasuense* Benth., of Costa Rica, but without the tomentulose indument of the stem found in that species.

Hieracium herrerae Blake, sp. nov.

Herbaceous perennial, single-stemmed, 25 cm. high; rootstock oblique, 3 cm. long, with many long fibrous rootlets; leaves about 7, crowded within 4 cm. of base of stem, the lower obovate, 6 cm. long (including the 1.5 to 2.5 cm. long, margined petiole), 1.5 to 2 cm. wide, rounded to obtuse, glandular-apiculate, cuneate at base, remotely glandular-denticulate, papery, pale green, densely lanate-pilose on both sides with canescent hairs, the upper obovate to lanceolate, acute to acuminate, 2.5 to 4.8 cm. long, 6 to 18 mm. wide; stem simple below the inflorescence, griseous-tomentulose throughout and setulose with mostly gland-tipped hairs, these spread.

ing, blackish below, pale above, many-celled, 1 mm. long or less, the glands yellowish; heads about 8, about 29-flowered, subracemose, remote; peduncles mostly 1-headed, 3 to 5 cm. long, densely pubescent like the stem, the lowest subtended by a linear-oblanceolate bract 1.5 cm. long, 1.5 mm. wide; involucre 1 to 1.1 cm high, 6 to (fruit) 20 mm. thick, the chief phyllaries 13, linear-lanceolate, blackish-green with thinner paler margins, densely stipitate-glandular (hairs 0.5 to 2 mm. long, similar to those of the stem) and sparsely pilosulous, the outer phyllaries or bracteoles few, two-thirds as long as the inner or less; corollas pale yellow, the lamina 4.5 mm. long, exceeding the tube, the styles pale; achenes gradually but slightly tapering from near base to apex, abruptly contracted at extreme apex, deep reddish or purplish brown, striate, glabrous, 4.2 to 4.5 mm. long; pappus bright white, rather soft and sparse, 6 mm. long.

Type in the U. S. National Herbariun, no. 1,038,789, collected in the State of Durango, Mexico, altitude 1,000 meters, by P. Ibaña García (no. 466).

Related to *Hieracium pringlei* A. Gray and *H. jaliscense* Robins. & Greenm., but readily distinguished from either by its much longer achenes, as well as by marked differences in pubescence.

The species is named for Dr. A. L. Herrera, director of Biological Studies in Mexico.

STEVIA TEPHROPHYLLA BLAKE

GUTIERREZIA GRANDIS BLAKE

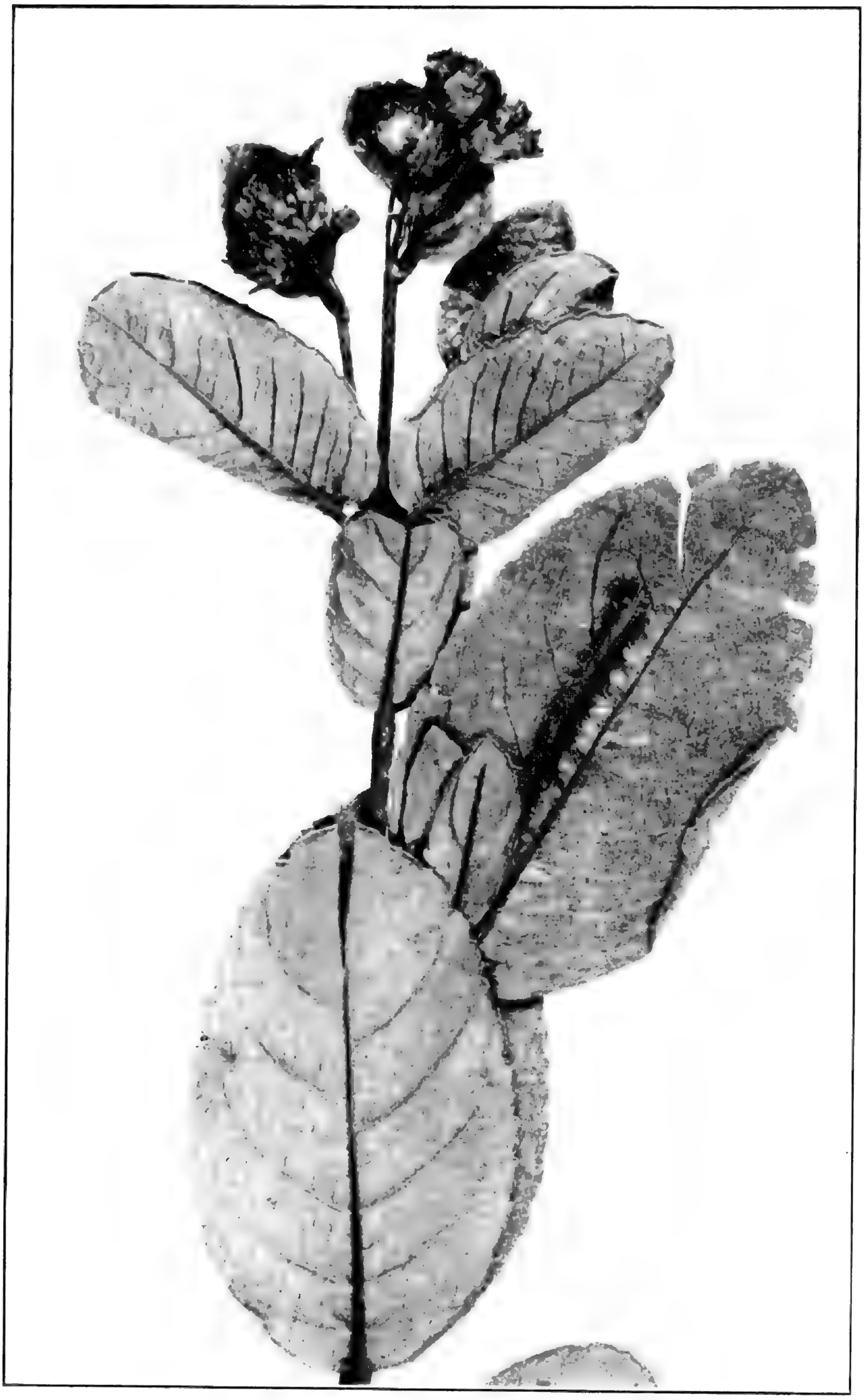
ERIGERON MAXONII BLAKE

ACHYROCLINE CRASSICEPS BLAKE

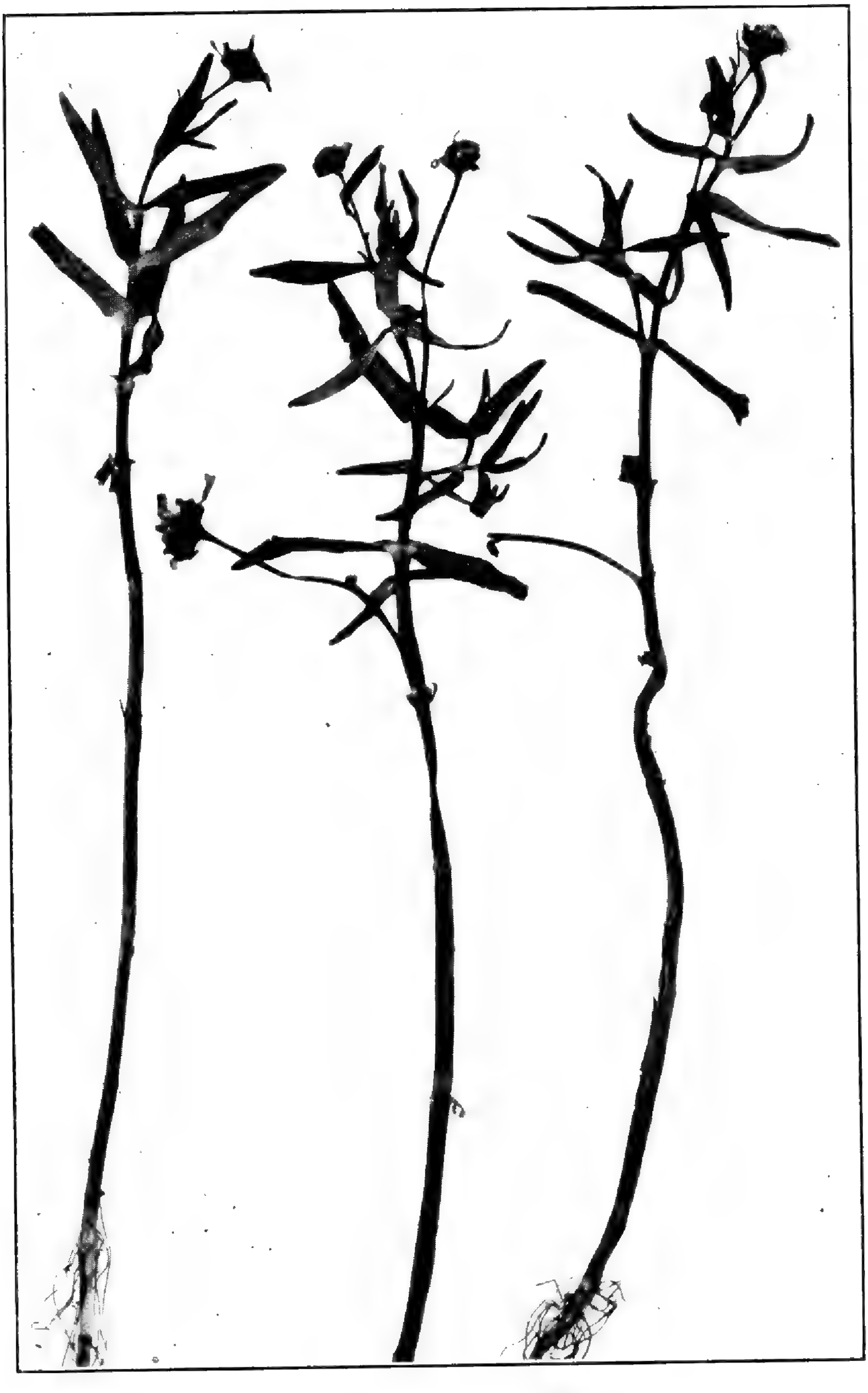
PARTHENIUM DENSIPILUM BLAKE

FLOURENSIA HIRTISSIMA BLAKE

VERBESINA BACCHARIDEA BLAKE



CALEA OVALIS BLAKE



TRICHOCORYNE CONNATA BLAKE

PROUSTIA CUNEATA BLAKE

INDEX.

[Synonyms in italics. Page numbers of principal entries in heavy-face type.]

Page.

Achyrocline crassiceps **596**
Actinomeris *pachyphylla* 647
Ageratum albidum **588**
corymbosum 588
elassocarpum 588
paleaceum 588
salicifolium 589
annectens 588
Altamirania 647
pachyphylla 647
Altamiranoa 647
Amphiachyris 592
dracunculoides 592
Amphipappus 592
dracunculoides 592
fremontii 592
Aplopappus stoloniferus 594
Aspilia 619
angusta **619**
angustifolia 619
eggersii 619
hirsuta 619
jelskii **619**
lanceolata **619**
linearifolia 619
linearis **619**
macrolepis **617**
pachyphylla 647
patentipilis **617**
retroflexa **618**
tenella **620**
triplinervia **620**
Aspiliopsis 647
pachyphylla 647
Baccharis alamosana **595**
occidentalis **595**
potosina 596
Bellis garciae **593**
mima **594**
purpurascens 594
Bidens *atriplicifolia* 614
Bowmania verbascifolia 655
Brachyris 592
dracunculoides 592
angustissima 592
ramosissima 592
Calea albida 646
brandegei 647
brevipes **647**
elegans 627
glomerata 647
hypoleuca 646
insignis 627
leptocephala **646**
manicata 647
ovalis **645**
pachyphylla **647**
pennellii **644**
peruviana 644

Page.

Calea rupestris 647
sororia **645**
tejadae **646**
tolimana 645
zacatechichi 646, 647
Clibadium acuminatum 599
anceps 602, 603
appressipilum **600**
arboreum 600, 601, 602
caudatum **600**
eggersii 597
erosum 600
grande **601**
grandifolium **599**, 601
leiocarpum 603
micranthum 603
parviceps **598**
pentaneuron **598**
propinquum **597**
pueblanum **601**
schulzii **602**
sodiroi 597
surinamense 603
sychnocephalum **603**
sylvestre 602
trianae 603
vargasii 602
Coelestina (section of Ageratum) 588, 589
Conyza *stellata* 587
Coreopsis boliviana **644**
buchii **641**
capillacea 643
longula **642**
oblanceolata **642**
spectabilis 644
townsendii **643**
triloba **643**, 644
venusta 643
Diazeuxis trinervis 653
Dyssodia 650
hartwegii 650
wootoni **650**
Electra (section of Coreopsis) 642
Eremosis ovata 587
Erigeron irazuensis 595
maxonii **594**
Espeletia argentea 604
phaneractis **603**
Fleischmannia standleyi **590**
Flor de San Francisco 613
Flourensia hirta 630
hirtissima **629**
Galeana 649
Gochnatia boliviana **651**
curviflora 652
glutinosa viscosissima 653
hypoleuca 652
obtusata **652**
viscosissima **653**

	Page.
Guardiola tulocarpus	605
pubescens	**605**
Gutierrezia digyna	591, 592
dracunculoides	**592**
euthamiae	593
glomerella	592
grandis	**592**
lindheimeriana	592
sarothrae	593
sphaerocephala	592
Gymnolomia	619
connata	619
hirsuta	619
hondensis	619, 620
kunthiana	619
jelskii	619
rudbeckioides	619, 630
tenella	619, 620
triplinervia	619, 620
Hecubaea aptera	**649**
scorzoneraefolia	650
Helianthus grandiceps	**621**
jelskii	621
lehmannii	621
niveus	621
subniveus	**621**
Heliopsis	609
longipes	**608**
Hieracium abscissum	658, 659
morelosanum	**658**
arsenei	**656**
bulbisetum	659
comaticeps	**659**
crepidispermum	657
frigidum	660
herrerae	**660**
irasuense	660
jaliscense	661
jaliscopolum	**657**
junceum	657
maxonii	**660**
melanochryseum	**659**
mexicanum	657, 660
nicolasii	**657**
oaxacanum	659
panamense	**658**
pringlei	661
prionobium	657
wrightii	658
Huamanpeta	653
Hymenatherum	650
Hymenostephium	619, 630
rudbeckioides	**630**
Isocarpha atriplicifolia	614
billbergiana	614
blepharolepis	614
cubana	**613**
divaricata	614
glabrata	**614**
oppositifolia	614
Jaliscoa pappifera	**587**
pringlei	588
Kuhnia oreithales	591
triplinervis	**591**
Laestadia costaricensis	**593**
lechleri	593
Lechugilla	658
Leighia (section of Viguiera)	**620**
Leptosyne (subgenus of Coreopsis)	**642**
Lipactinia (section of Verbesina)	640, 641
Lycoseris bracteata	**653**
trinervis	**653**
Malacothrix floccifera	**656**
obtusa	656
Melampodium argophyllum	**606**
cinerascens	**605**
cinereum	606
argophyllum	606
longicornu	606
microcarpum	**606**
mimulifolium	607
rosei	607
Melanthera lanceolata	629
microphylla	629
oxycarpha	**628**
purpurascens	**629**
Montanoa affinis	**612**
anomala	611
arsenei	**611**
frutescens	611
myriocephala	611
patens	612
pilosipalea	**612**
purpurascens	611
rekoi	**610**
subglabra	**611**
subtruncata	613
uncinata	611, 612
xanthiifolia	611
Nocca helianthifolia	597
media	**596**
pringlei	597
pteropoda	**597**
Ochractinia (section of Verbesima)	639
Ocotillo	610
Oteiza	627
acuminata	**627**
Otopappus scaber	**636**
verbesinoides	637
Oyedaea	636
reticulata	636
Parthenium densipilum	**607**
fruticosum	608
hysterophorus	607
parviceps	**607**
Perezia wislizeni	653
megacephala	653
minor	**653**
Perymenium acuminatum	**627**
asperifolium	626
blepharolepis	626
cervantesii	622
chihuahuense	**625**
consobrinum	**626**
cornutum	623
flexuosum	622
goldmanii	624
gracile	623
hypoleucum	626
jaliscense	622
lancifolium	**623**
lasiolepis	**625**
latisquamun	**626**
nicaraguense	**624**

Page.

Perymenium oxycarphum 622
parvifolium 625
purpusii 624
rotundisquamum 623
ruacophilum 627
rude 625
simulans 621
strigillosum 627
subcordatum 622
tenellum 622
Philactis 608
longipes 608
zinnioides 608
Pinaropappus *caespitosus* 656
parvus 655
spathulatus 656
Polymnia apus 604
edulis 604
microcephala 605
parviceps 604
Proustia baccharoides 653
cuneata 653
Rumfordia oreopola 609
verapazensis 609
Sabazia anomala 615
leiachaenia 614
radicans 615, 616
sarmentosa 615, 616
triangularis 615
Saubinetia (section of Verbesina) 638, 639
Sclerocarpus columbianus 609
phyllocephalus 610
Selleophytum 641
buchii 641
Senecio *flocciferus* 656
Simsia sanguinea 630
albida 630
palmeri 630
Steiractinia longipes 628
mollis 628
ocanensis 628
oyedaeoides 628
rusbyana 627
Stevia flourensioides 589
integra 589
pelophila 589
tephrophylla 590
vernicosa 589
Tagetes crassiceps 651
Tetrachyron (section of Calea) 647
Thymophylla 650
Trichocoryne 648
connata 649
Tridax oligodonta 648
stuebelii 648
Trixidium (section of Chibadium) 598
Trixis adenolepis 654
angustifolia 654
bowmanii 655
frutescens 655
gigas 655
glaziovii 655
grandis 655
haenkei 654
peninsularis 654
radialis 655

Page.

Trixis rugulosa 655
verbascifolia 655
Vara prieta 605
Verbesina acuminata 639
angustifolia 639
arborea 640, 641
baccharidea 641
crassiramea 640
cymbipalea 638
guianensis 641
laevis 639
nelsonii 638
otophylla 638
oxylepis 637
pennellii 640
persicaefolia 638
schomburgkii 641
seemannii 639
stricta 637
synethes 639
synotis 637
szyszylowiczii 639
Vernonia durangensis 587
gleasoni 587
gleasonii 587
oppositifolia 587
ovata 587
stellata 587
Viguiera apiculata 620
Wedelia helianthoides 617
heterophylla 617
latifolia 617
oxylepis 616
symmetrica 617
Werneria articulata 651
brachypappa 651
brachypappus 651
cochlearis 651
denticulata 651
lehmannii 651
pygmaea 651
Wulffia *sodiroi* 597
Yagazeche 610
Yarita 605
Zaluzania 626
Zexmenia 636
aggregata 634
aurea 631
brevifolia 636
ceanothifolia 632, 633, 634
cordifolia 633
costaricensis 635
elegans 634
fasciculata 632
frutescens 635
fruticosa 632
gnaphalioides 636
gradata 632
macropoda 634
media 630
michoacana 631
oxyedaeoides 636
rotundata 632
subsericea 635
Zinnia 642
bicolor 608
leucoglossa 608

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STUDIES IN AMERICAN PHASEOLINEAE

By C. V. PIPER

WASHINGTON
GOVERNMENT PRINTING OFFICE
1926

PREFACE

This part of the Contributions, by Dr. C. V. Piper, of the United States Department of Agriculture, is devoted to a study of certain groups of the tribe Phaseolineae of the family Fabaceae. A key is given to the American genera, several of which have been described as new within recent years. Two genera, *Alepidocalyx* and *Condylostylis*, are described for the first time in the present paper.

Keys are given to the species of some of the smaller genera and to the members of some of the sections of *Phaseolus*. The last genus is of great economic importance because it contains the common and lima beans, besides several other species whose seeds are articles of human food. Many of the species of *Phaseolus* have been imperfectly understood, and it is highly desirable that in so important a genus the relationship of the species should be determined definitely. The difficulty of such a study is greatly increased by the unusual variation in foliage characters exhibited by many species of *Phaseolus*.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

CONTENTS

	Page
Introduction	663
Key to American genera of Phaseolineae	664
Monoplegma	664
Vigna	665
Condylostylis	667
Strophostyles	668
Ramirezella	669
Minkelersia	670
Alepidocalyx	672
Phaseolus	673
Section Sigmoidotropis	674
Section Cochliasanthus	677
Section Lasiospron	677
Section Microcochle	679
Section Macroptilium	680
Section Ceratotropis	682
Phaseolus coccineus and its allies	683
Phaseolus angustissimus, *P. filiformis*, and *P. wrightii*	687
Phaseolus metcalfei and its close relatives	687
Phaseolus pedicellatus and its allies	688
Phaseolus micranthus, *P. brevicalyx*, and *P. opacus*	695
Miscellaneous species, section Euphaseolus	696
Index	VII

ILLUSTRATION

	Facing page
PLATE 64. *Condylostylis venusta*	668

STUDIES IN AMERICAN PHASEOLINEAE

By C. V. Piper

INTRODUCTION

The Phaseolineae include those papilionate legumes having the peduncles "knotty," that is, covered with pedicellar glands, and with the style bearded. The principal genus is *Phaseolus*, and the other long-recognized ones are *Physostigma, Minkelersia, Voandezia, Vigna, Pachyrhizus, Dolichos,* and *Psophocarpus*. In recent times several of the groups long since proposed as genera have been reestablished, such as *Lablab, Otoptera, Sphenostylis,* and *Chloryllis*. Newly proposed genera include *Dyslobium, Ramirezella, Oxyrhynchus, Monoplegma, Kerstingiella, Dolichopsis, Adenodolichos,* and *Spathionema*. *Strophostyles* Elliott is commonly recognized by American botanists. There is thus exhibited a marked tendency to enlarge the number of genera. In this process *Dolichos* has been divided into four genera, *Vigna* into five, while from *Phaseolus* Prain has wisely separated *Dyslobium* and the American botanists retain *Strophostyles*.

Of the genera listed above, *Minkelersia, Pachyrhizus, Ramirezella, Oxyrhynchus, Monoplegma, Dolichopsis,* and *Strophostyles* are purely American; *Phaseolus* is predominatingly a New World genus, while *Vigna* is largely Old World. The other genera are all Old World. *Dipogon* Liebmann from Brazil is obscure but is referred by Harms to *Dolichos*.

Of the 12 American genera, two, *Condylostylis* and *Alepidocalyx,* are here first proposed. *Plectrotropis* Schum. & Thonn. is considered a valid genus. *Oxyrhynchus* has been discussed at length by Piper.[1] In the present paper *Minkelersia* and *Ramirezella* are fully treated. Notes and in most cases new species are here given in all the other genera except *Pachyrhizus* and *Dolichopsis*.

In the course of this study material has been examined in various herbaria, and if cited is indicated by the following symbols:

N. United States National Herbarium.
G. Gray Herbarium.
Y. New York Botanical Garden.
K. Royal Botanic Gardens, Kew.

[1] Journ. Washington Acad. Sci. **14**: 46–49. 1924.

L. British Museum (Natural History).
P. Muséum d'Histoire Naturelle, Paris.
B. Jardin Botanique de l'Etat, Brussels.
F. Field Museum of National History.
Mo. Missouri Botanical Garden.
E. Botanical Garden, Edinburgh.

To the directors of all these institutions thanks are hereby extended. The material from the Estación Experimental Agronómica, Santiago de las Vegas, Cuba, was kindly sent for study by Dr. G. M. Fortún; that from the Botanic Gardens, Georgetown, British Guiana, by Dr. R. A. Ackson; and that from his private herbarium by Dr. L. H. Bailey, Ithaca, New York. The University of Halle, Germany, kindly lent the type of *Phaseolus obvallatus* Schlecht. for examination. Dr. H. Ross, of the Botanisches Museum, Munich, supplied a photograph and a fragment of the type of *P. pedicellatus* Benth. To all of these we extend thanks.

KEY TO AMERICAN GENERA OF PHASEOLINEAE

Keel straight, not laterally curved or coiled.
  Stigma surrounded by a ring of hairs ..... **OXYRHYNCHUS.**
  Stigma not surrounded by a ring of hairs.
    Style tip explanate, the stigma lateral. Pods septate ..... **PACHYRHIZUS.**
    Style tip not explanate.
      Plants shrubby; upper calyx lip longer than the lower; pods woody, not septate ..... **MONOPLEGMA.**
      Plants herbaceous; upper calyx lip shorter than the lower; pods not woody.
        Pods septate ..... **DOLICHOPSIS.**
        Pods not septate ..... **VIGNA.**
Keel laterally curved, curled, or coiled.
  Keel merely curved.
    Style with a globose enlargement near the middle ..... **CONDYLOSTYLIS.**
    Style filiform.
      Keel with a protuberance on the left side ..... **PLECTROTROPIS.**
      Keel without lateral protuberance.
        Bracts small, few-nerved ..... **STROPHOSTYLES.**
        Bracts large, many-nerved ..... **RAMIREZELLA.**
  Keel curled or coiled.
    Calyx lobes all longer than the tube ..... **MINKELERSIA.**
    Calyx lobes not all longer than the tube.
      Bracteoles none ..... **ALEPIDOCALYX.**
      Bracteoles present ..... **PHASEOLUS.**

MONOPLEGMA

Monoplegma trinervium (Donn. Smith) Piper.

Dioclea trinervia Donn. Smith, Bot. Gaz. **56**:53. 1913.

Monoplegma sphaerospermum Piper, Journ. Washington Acad. Sci. **10**:432. 1920.

Dr. J. N. Rose has called my attention to the identity of these two plants, which necessitates a change in name.

VIGNA

Vigna, excluding *Otoptera* and *Sphenostylis*, is represented by far more species in the Old World than in the New. *Ramirezella* and *Dolichopsis* both appear to be valid genera distinct from *Vigna*, but the American species left in *Vigna* are very diverse forms.

Vigna aristata Piper, sp. nov.

Herbaceous; stems terete, very sparsely puberulent; stipules lanceolate, acute, pubescent, 5-nerved, 5 mm. long; petioles shorter than the leaflets; stipels lance-linear, acute, pubescent, 3-nerved, 5 mm. long; leaflets 3, membranous, ovate, acuminate to an acute point tipped with an awn 3 mm. long, broadly cuneate at base, nearly glabrous on both sides but with a few hairs along the veins, not paler beneath, 8 to 10 cm. long; peduncles about as long as the leaves; racemes more or less congested, 5 to 12 flowered; pedicellar glands elongate; bracts oblong-obovate, acuminate, sparsely pubescent, 7-nerved, 7 mm. long, concealing the bud; pedicels glabrous, one-fifth as long as the calyx; bracteoles oblong, acute, pubescent, 7-nerved, as long as the calyx tube; calyx campanulate, 7 to 8 mm. long, pubescent, ciliate, the short upper lip emarginate, the lower lip with 3 subequal triangular acute teeth nearly as long as the tube; corolla purple (?), 2 cm. long; standard orbicular, not emarginate, strongly reflexed at the middle, the basal half compressed to form a deep trough, each edge of this much thickened and projecting to form a ridge basally expanded into a lobe, the stipe short and curved; wings as long as the standard, the blade broadly spatulate, its upper basal angle produced into a rounded lobe, the broad stipe half as long as the blade; keel strongly falcate, not at all twisted, short-beaked at orifice, minutely ciliate toward the tip, the blades angled at base, the stipes short; stamens united for more than half their length, the free one enlarged and curved at base; anthers yellow, oblong, notched at base; ovary linear, puberulent; style much thickened above, and for 4 mm. below the stigma minutely antrorse-puberulent; stigma terminal, produced on the ventral side; very young pod much compressed.

Type in the U. S. National Herbarium, no. 1,191,864, collected at Salento, Caldas, Colombia, July, 1922, "cultivated in a garden," by A. J. Salazar (no. 10).

A noteworthy species which adds to the very diverse forms now referred to the genus *Vigna*.

Vigna lonchophylla Piper, sp. nov.

Herbaceous vine; stems slender, terete, sparsely retrorse-puberulent; stipules triangular, acute, brownish, faintly 3-nerved, 2 to 3 mm. long; petioles slender, shorter than the leaflets, the portion between the lateral and terminal leaflets elongate; stipels lanceolate, acute, 3-nerved, brown, 2 mm. long; petiolules puberulent; leaflets 3, membranous, lanceolate, acute and apiculate, rounded at base, sparsely puberulent on both sides, 12 to 15 mm. long; peduncles much exceeding the leaves; racemes loose, 10 to 15 flowered; pedicellar glands prominent; bracts caducous, not seen; pedicels glabrous, twice as long as the calyx; bracteoles orbicular, strongly 5-nerved, one-fourth as long as the calyx; calyx campanulate, glabrous except the ciliate margin, 7 mm. long, the short upper lip scarcely emarginate, the lateral teeth broadly triangular, acute, the median tooth longer and narrower, as long as the calyx tube; corolla purple (?), 12 mm. long; standard nearly orbicular, emarginate, thickened in the middle below, a deep sinus at base, short-stipitate, a small inflexed auricle at base of blade on each side, 10 to 12 mm. long, nearly as broad; wings obliquely obovate, obtuse, cuneate at base, not stipitate, without auricles, two-thirds as long as the keel; keel tubular, falcate, the mouth oblique; anthers rectangular in outline, notched

at base, in two series as to length; style beard short-haired, continuous below the stigma for 3 mm.; stigma roundish, terminal, oblique; pods linear, terete, long-beaked, sparsely strigillose, about 5-seeded, 5 mm. long.

Type in the herbarium of the Field Museum of Natural History, no. 95557, collected at Hacienda Coahuayula, Michoacán, Mexico, February, 1901, by G. M. Emrick (no. 97).

Vigna myrtifolia Piper, sp. nov.

A somewhat woody vine; stems terete, pilose; stipules lanceolate, broadest at base, 5 to 7 nerved, pubescent, 5 mm. long; petioles hirtellous, about as long as the leaflets; stipels like the stipules but only 3-nerved and 3 mm. long; leaflets lanceolate, broadest in the middle, coriaceous, reticulate-veined, obtusish at each end, sparsely appressed-pubescent on each side, 5 to 7 cm. long; peduncles slender, pubescent with reflexed hairs, 20 cm. long, bearing about 12 rather crowded sessile flowers; bracts lanceolate, 3-nerved, pubescent, 2 mm. long; calyx turbinate, pubescent, 3 mm. long, the upper lip with 2 short, broad, triangular teeth, the lower with 3 narrower, triangular, acute teeth about two-thirds as long as the tube; bracteoles linear, one-third as long as the calyx; corolla 6 mm. long, yellowish; standard orbicular, the two edges attached in bud; keel strongly incurved at tip, not at all twisted; free stamen enlarged to near the base, then obliquely stipitate; anthers oblong, yellow; ovary linear, glabrous, 5-ovuled; style at nearly a right angle to the ovary, and elbowed near the tip, glabrous except a small tuft of hairs below the stigma on the inner side, the hairs successively longer toward the stigma; stigma globose, obliquely terminal.

Type in the herbarium of the New York Botanical Garden, collected at Buena Vista, Sara, Santa Cruz, Bolivia, May 10, 1921, by J. Steinbach (no. 5635).

The very scanty material, not yet in full bloom, permitted only an incomplete examination of the flowers. As at present predicated, the plant falls in the genus *Vigna*, but it is very different from any other species known.

Vigna strophiolata Piper, sp. nov.

Herbaceous vine; stems slender, terete, sparsely pilose; stipules narrowly triangular-lanceolate, acute, 5 to 7 nerved, pilose beneath, 6 mm. long, each bearing a basal appendage 2 mm. long; petioles sparsely pilose, shorter than the leaflets; stipels triangular-oblong, acute, 1 mm. long; leaflets membranaceous, somewhat rectangularly oblong, abruptly acuminate, truncate at base, sparsely pubescent on both sides, 5 to 6 cm. long; peduncles about as long as the leaves, sparsely pilose; racemes 10 to 15 flowered, the pedicellar glands not large, the flowers mostly in pairs; pedicels a little shorter than the calyx; bracts not seen, quickly fugacious; bracteoles lanceolate, 1-nerved, one-third as long as the calyx; calyx turbinate, nearly glabrous, the upper lip bidentate, the lower lip with 3 subequal triangular acute teeth as long as the tube; corolla yellow, 12 mm. long; pods linear, sparsely puberulent, 3 cm. long, bearing a very short recurved beak, 7-seeded; seeds rhomboidal, brown, shiny, 3 to 4 mm. long, prominently strophiolate.

Type in the herbarium of the New York Botanical Garden, collected in Barbados, West Indies, by J. R. Bovell (no. 443).

This species is readily distinguished by its peculiar leaflets, produced stipules, and particularly by its strophiolate seeds.

Vigna populnea Piper, sp. nov.

Herbaceous, apparently vining; stems terete, 2 to 4 mm. in diameter, pale, minutely appressed-puberulent; stipules triangular, acute, striate, 3 mm. long; petioles equaling or exceeding the leaflets, puberulent; stipels lanceolate, acute, curved, 3-striate, 3 mm. long; leaflets membranaceous, broadly ovate, acuminate with the tip blunt and long-apiculate, rounded or truncate or somewhat cuneate at base, 5 to 10 cm. long, very sparsely strigillose on both surfaces, a little paler

beneath; peduncles 30 to 40 cm. long; racemes many-flowered, the pedicellar glands subglobose; pedicels glabrous, nearly as long as the calyx; calyx campanulate, glabrous except the sparsely ciliate margin, the upper lip short and emarginate, the lower lip with subequal oblong obtuse lobes about as long as the calyx tube; corolla white (?), 12 mm. long; standard orbicular, emarginate, short-stipitate, transversely thickened near the base, the basal auricles short and inflexed; wings as long as the standard, oblong, obtuse, thickened on the upper margins, the stipe one-third as long as the blade; keel falcate, ciliate on the upper margin, the beek short and blunt, the stipe short; free stamen geniculate at base, broadened at the angle; style bearded on the inner side below the tip; stigma oblique; pods linear, compressed, glabrous, tipped with a stout curved beak, 10 cm. long, 1 cm. broad.

Type in the U. S. National Herbarium, no. 461986, collected near Monterrey, Nuevo León, Mexico, June 18, 1889, by C. G. Pringle (no. 2839). Duplicate in the Gray Herbarium.

The habit of the plant is very unlike that of any other American *Vigna*, the leaflets much resembling the leaves of species of *Populus*.

CONDYLOSTYLIS

Condylostylis Piper, gen. nov.

Twining herb; leaves trifoliolate; leaflets 3, each 3-nerved from the base; stipules and stipels striate-nerved; peduncles with pedicellar glands; bracteoles striate-nerved; calyx campanulate, the teeth broad, obtuse, short; standard orbicular, thickish, auricled; wings long-stipitate, oblong, constricted below the middle; keel long-stipitate, the lower portion broad, constricted and slightly twisted above the middle, the beak bottle-shaped; stamens diadelphous, the free one thickened at base and geniculate at a right angle; anthers oblong; style thickened toward the tip, beginning with a globose enlargement above the middle, constricted at the tip and bearing a spatulate appendage, bearded about the stigma and below a short bare space on the inner side; stigma roundish, lateral; pods linear, short-beaked, slightly compressed; seeds cylindriform, the linear hilum more than half as long as the seed.

Type species, *Condylostylis venusta* Piper.

The form of the style and peculiar keel amply distinguish the plant from either *Phaseolus* or *Vigna*.

Condylostylis venusta Piper, sp. nov. PLATE 64.

Herbaceous vine, glabrous throughout; leaves trifoliolate; petioles about as long as the leaflets; stipules broadly triangular, 2 mm. long, 7-nerved; stipels oblong, 3-nerved; leaflets thin, membranaceous, ovate, strongly acuminate, the tip obtuse and apiculate, rounded to truncate at base, 5 to 7 cm. long; peduncles stout, about as long as the leaves, 5 to 12 flowered; pedicels as long as the calyx; bracts suborbicular, strongly 11-nerved; bracteoles suborbicular, obtuse, 11 to 13 nerved, less than half as long as the calyx; calyx campanulate, 5 mm. long, finely ciliate, the broad upper lip emarginate, the 3 lower teeth broad and obtuse, about one-fourth as long as the tube; corolla apparently purple; standard nearly orbicular, emarginate at tip, 25 mm. long, short-stipitate, reflexed about the middle, the basal portion concave and much thickened, a wide flaplike auricle on each side but not marginal; wings oblong, curved, constricted below the middle, the upper portion oblong, the lower portion much thicker and folded to form a groove down the middle, the slender stipe 8 mm. long, the basal angle bearing a crenulate appendage 2 mm. long; keel curved, the slender stipe 7 mm. long, the basal half of the blade very broad and swollen, much constricted near the middle and slightly twisted, the tubular beak thickened; stamens diadelphous, the free stamen with the filament greatly thickened toward the base and geniculate at a right angle, the basal arm 6 mm. long; anthers oblong, 2 mm. long; style with

a somewhat heart-shaped swelling above the middle, constricted near the tip to form a spatulate sterile appendage bearded about the roundish lateral stigma and, after a short intervening bare space, on the inner side one-third of the distance to the swelling; pods linear, short-beaked, slightly compressed, 5 mm. long, 6 or 7 seeded; seeds cylindriform, mealy, 5 mm. long, 2 mm. thick, the linear hilum more than half as long as the seed.

Type in the herbarium of the Jardin Botanique, Brussels, collected at Surubres near San Mateo, Province of Alajuela, Costa Rica, by P. Biolley (no. 7034).

Another specimen in the Brussels herbarium was collected on the Río Ceibo near Buenos Aires, Province of Puntaarenas, Costa Rica, *Pittier* 4981; and one in the Gray Herbarium on Upper Moho River, British Honduras, *Peck* 745.

EXPLANATION OF PLATE 64. *Condylostylis venusta*. 1. Portion of shoot with leaves and raceme. 2. Lateral view of flower. 3. Standard. 4. Wings. 5. Keel petal. 6. Stamens. 7. Pistil. 8. Upper part of style. 9. Tip of style. 10. Stamen. 1, natural size; 2–10, enlarged.

Condylostylis phlebophylla Piper, sp. nov.

Twining herb; stems slender, terete, glabrous or nearly so; stipules triangular-oblong, obtuse, thickish, brown, pubescent, 5-nerved, 2 to 3 mm. long; petioles slender, sparsely pubescent, shorter than the leaflets; stipels oblong, brown, 2 mm. long; leaflets 3, membranous, ovate, acuminate to a blunt apiculate tip, rounded to truncate at base, the lateral slightly oblique, puberulent on both sides, paler beneath, reticulate-veined, 6 to 8 cm. long; peduncles shorter than the leaves, pubescent; pedicellar glands prominent; raceme few-flowered; bracts not seen; bracteoles broadly ovate, puberulent, 9-nerved, the nerves not reaching the thinner margin, nearly half as long as the calyx; calyx campanulate, minutely puberulent, 7 mm. long, the short upper lip emarginate, the lateral lobes broadly rounded, the median lobe ovate, acutish, thick, as long as the lateral and about one-third as long as the calyx tube; corolla "white"; standard orbicular, emarginate, thickish, 10 mm. long and broad, thickened and sulcate in the middle of the basal half, short-stipitate from a broad shallow basal sinus, a large inflexed auricle on each side of the base of the blade; wings as long as the keel, the blades broad, strongly curved, constricted in the middle, rounded at apex, truncate at base and produced on the upper angle, the rather broad stipe 4 mm. long; keel slightly twisted, broad, strongly curved, the basal half flat, truncate, with a stipe 5 mm. long, the terminal half narrower, inflated, and tipped with a short narrow tube 3 mm. long; free stamen much thickened at base and geniculate at a right angle; stamen tube much broadened at base, the filaments united for two-thirds their length; anthers oblong, yellow; style with a globose enlargement at two-thirds its length from the base; style beard dense, the hairs somewhat reflexed, extending 3 mm. below the stigma; stigma round, lateral, a flat oblong appendage extending beyond; ovary linear, scabrous, several-ovuled.

Type in the U. S. National Herbarium, no. 1,143,493, collected at Cuchilla, east of Zarzal, Cauca Valley, Colombia, altitude 1,200 to 1,600 meters, July 27, 1922, by Pennell, Killip, and Hazen (no. 8550).

STROPHOSTYLES

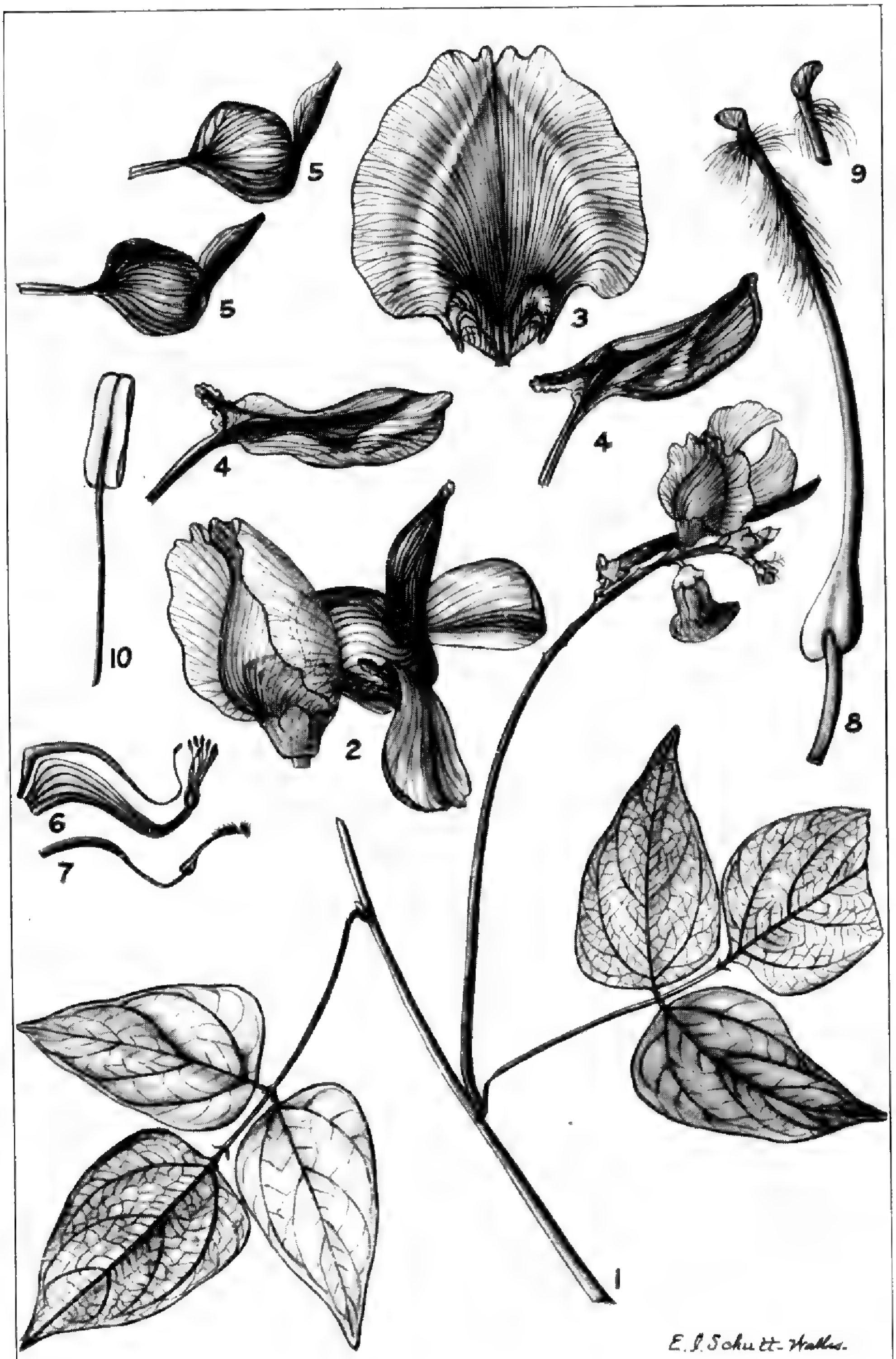
This genus seems to contain but three species, largely confined to the United States, but one, *S. helvola* (L.) Britton, ranges northward into Quebec, and another southward into Mexico. The last needs modification in its name.

Strophostyles leiosperma (Torr. & Gray) Piper.

Phaseolus leiospermus Torr. & Gray, Fl. N. Amer. **1**: 280. 1838.

Phaseolus pauciflorus Benth. Comm. Leg. Gen. 76. 1837. Not *P. pauciflorus* Don, 1832.

Strophostyles pauciflora S. Wats. in A. Gray, Man. ed. 6. 145. 1890.



CONDYLOSTYLIS VENUSTA PIPER

RAMIREZELLA

This genus is seemingly valid, being based primarily on its rostrate curved keel, crowded large flowers, and large many-nerved bracts. The species are confined to Mexico, except one in Salvador. Six of the eight species are very closely related one to another.

KEY TO THE SPECIES

Lower calyx lip half as long as tube ..... **1. R. lozanii.**
Lower calyx lip less than half as long as tube.
  Bracteoles 1-nerved; pods narrow; rachis not thickened ..... **2. R. nitida.**
  Bracteoles 3-nerved; pods broad; rachis thickened.
    Leaflets pubescent beneath.
      Calyx glabrous except the ciliation; pods glabrous .. **3. R. strobilophora.**
      Calyx pubescent; pods pubescent ..... **4. R. pubescens.**
    Leaflets glabrous or nearly so.
      Pedicels three times as long as calyx ..... **5. R. buseri.**
      Pedicels short.
        Leaflets thin, shiny beneath ..... **6. R. glabrata.**
        Leaflets thickish, dull.
          Corolla 2 cm. long ..... **7. R. ornata.**
          Corolla 1.5 cm. long ..... **8. R. occidentalis.**

1. Ramirezella lozanii (Rose) Piper.

Phaseolus lozanii Rose, Contr. U. S. Nat. Herb. **12**: 274. 1909.

MEXICO: Uruapan, Michoacán, *Pringle* 10358 (type; N).

2. Ramirezella nitida Piper, sp. nov.

Vine, somewhat woody below, glabrous to the inflorescence; stems terete, up to 2 mm. in diameter; stipules ovate, acute, firm, striate, persistent, 5 mm. long; petioles slender, not as long as the leaflets; stipels narrowly triangular, striate, persistent; petiolules pubescent; leaflets very thin and pellucid, ovate, attenuate-acuminate, apiculate, rounded at base, 3-nerved, reticulately veined, shiny on both sides, 6 to 8 cm. long, 3 to 4 cm. broad; peduncles appressed-puberulent, exceeding the leaves; racemes 10 to 15 flowered; bracts firm, ovate, acuminate, striate, quickly deciduous, 6 to 10 mm. long; pedicellar glands small; pedicels longer than the calyx, 3 to 4 mm. long; bracteoles oblong, minute, about one-fourth as long as the calyx; calyx campanulate, glabrous, 4 mm. long, the upper lip very short, emarginate, the lower lip 3-toothed, the lateral ones broadly triangular, acute, the median narrower and longer, two-thirds as long as the tube; corolla violet; standard orbicular, emarginate, reflexed, 12 mm. long, stipitate, the short broad stipe as long as the basal sinus, the auricles not inflexed, the prominent callosities linear; wings 10 mm. long, much shorter than the keel, oblong-spatulate the margins inrolled, the blade tapering into the stipe; keel rostrate, strongly curved, twisted one-half turn toward the tip, broadened near the middle, tapering into the stipe, 20 mm. long along the line of the curve; vexillar stamen free, thickened and geniculate at base; anthers oblong; ovary linear, glabrous; style villous in the uppermost coil; stigma terminal, globose, surrounded by a circlet of a few hairs; pods straight or slightly curved, terete, glabrous, 8-seeded, papery within, 10 cm. long, the tip with a slender curved beak; seeds oblong, reddish marbled with brown, dull, 6 mm. long, 3 mm. wide, 2 mm. thick, the linear hilum two-thirds as long as the seed.

Type in the U. S. National Herbarium, no. 397766, collected near Los Caños, San Luis Potosí, Mexico, October, 1902, by Edward Palmer (no. 217).

3. Ramirezella strobilophora (Robinson) Rose, Contr. U. S. Nat. Herb. **8**: 44. 1903.

Vigna strobilophora Robinson, Proc. Amer. Acad. **27**: 167. 1892.

ILLUSTRATION: Gard. & For. **7**: 155.

MEXICO: Guadalajara, Jalisco, *Pringle* 5163 (type; G, N), 4503 (N); *Rose & Painter* 7361 (N). Sierra Madre near Seven Star Mine, *Safford* 07, 136 (N). Chihuahua, *Townsend & Barber* 412 (N).

4. Ramirezella pubescens Rose, Contr. U. S. Nat. Herb. **8**: 45. 1903.

MEXICO: Road between Tlapa and Tlaliscatilla, Guerrero, *Nelson* 2046 (type, N).

5. Ramirezella buseri (Micheli) Rose, Contr. U. S. Nat. Herb. **12**: 274. 1909.

Phaseolus buseri Micheli, Mém. Soc. Phys. Nat. Genève **34**: 263. *pl. 13*. 1903.

Ramirezella pringlei Rose, Contr. U. S. Nat. Herb. **12**: 274. 1909.

MEXICO: Sierra Madre, Michoacán or Guerrero, *Langlassé* 799. La Bateele, Michoacán or Guerrero, *Langlassé* 661 (type collection of *P. buseri;* N). Tula, *Pringle* 10218 (type of *R. pringlei;* N).

6. Ramirezella glabrata Rose, Contr. U. S. Nat. Herb. **8**: 45. 1903.

MEXICO: Bolaños, Jalisco, *Rose* 2853 (type; N). Between Huejuquilla and Mesquitec, Jalisco, *Rose* 2562 (N).

7. Ramirezella ornata Piper, sp. nov.

Perennial, herbaceous vine; stems terete, glabrous or sparsely strigulose; stipules oblong-ovate, acute, many-nerved, 5 mm. long; petioles mostly shorter than the leaflets, appressed-pubescent; leaflets three, membranous, ovate, the lateral slightly oblique, long-acuminate, the tip cuspidate, rounded at base, similarly green on both sides, sparsely strigulose on each side, 5 to 8 cm. long; peduncles 6 to 8 cm. long, about equaling the raceme; rachis of the inflorescence thick, nearly glabrous; raceme crowded, 15 to 20 flowered; bracts chartaceous, ovate, acute, many-nerved, 1 cm. long; pedicels 2 cm. long; calyx campanulate, glabrous, 7 to 8 mm. long, the lobes subequal, rounded, ciliate, less than half as long as the tube; corolla 2 cm. long; pods cylindrical, straw-colored, glabrous, thick-valved, 15 cm. long, twisting 3 times in dehiscence; seeds lenticular, 1 cm. in diameter, 4 mm. thick, shiny, reddish brown, mottled darker; hilum oblong, white, half as long as the seed.

Type in the U. S. National Herbarium, no. 1,152,147, collected August, 1922, at San Salvador, Salvador, where cultivated under the name "choncho," by Dr. Salvador Calderón (no. 1174). Also collected in June, 1925 (no. 2304), in flower, and February, 1923, in ripe fruit.

Allied to *R. strobilophora*, but at once distinguished by the glabrous stipules, nearly glabrous leaves, and larger flowers, the largest in the genus.

8. Ramirezella occidentalis Rose, Contr. U. S. Nat. Herb. **8**: 45. 1903.

MEXICO: Acapulco, *Palmer* 179 (type; N); *Thiebaud* 1163 (P).

MINKELERSIA

This genus was based on a single species, *M. galactoides* Mart. & Gal., from the Cordillera of Oaxaca near the Pacific Ocean, 1,200 to 1,800 meters altitude, Mexico, collected by Galeotti (no. 3175). A second species, *M. biflora*, was proposed by Hemsley,[1] the type from the Valley of Mexico, collected by Schaffner. Both are figured by Hemsley in the Biologia Centrali-Americana.[2] The essential difference between the two supposed species was that the peduncles of the former

[1] Diag. Pl. Mex. 48. 1880.

[2] **5**: *pl. 16*.

were 1-flowered, of the latter 2-flowered. This character breaks down completely, some of the specimens in the National Herbarium having both types of peduncles on the same plant.

Rose [1] added two species with racemose inflorescence to the genus, *M. multiflora* and *M. pauciflora*, both from Mexico. An additional species, *M. vulcanica*, is described here.

The most striking character of the genus is the calyx, the five subequal lobes of which are much longer than the calyx tube.

KEY TO THE SPECIES

Peduncles each bearing one or two flowers. Bracteoles wanting.
1. M. galactoides.
Peduncles each bearing a raceme.
Bracteoles minute; stipules and bracts small, lanceolate--- **2. M. pauciflora.**
Bracteoles wanting; stipules and bracts large, broadly ovate.
Herbage glabrous or nearly so---------- **3. M. multiflora.**
Herbage pubescent---------- **4. M. vulcanica.**

1. Minkelersia galactoides Mart. & Gal. Bull. Acad. Brux. 10 [3]: 200. 1843.
Minkelersia biflora Hemsl. Diag. Pl. Mex. Pl. 48. 1880.

The specimens examined are all in the National Herbarium.

CHIHUAHUA: Pine lands, base of Sierra Madre, *Pringle* 1232. Marsh Lake, September 19, 1903, *Jones*. Near Colonia García, *Townsend & Barber* 319.

SINALOA: Tres Hermanos, Concordia, *Dehesa* 1548.

ZACATECAS: Near Plateado, on road from Colotlán, *Rose* 2696.

JALISCO: Sierra Madre, west of Bolaños, *Rose*.

MICHOACÁN: Morelia, *Arsène* 5841, 2579. Cerro Azul, *Arsène* 6576. Carocal, *Altamirano* 859.

2. Minkelersia pauciflora Rose, Contr. U. S. Nat. Herb. **5**: 142. 1897.

The specimens examined are all in the National Herbarium.

JALISCO: Sierra de los Morones, near Plateado, *Rose* 2722. Sierra Madre, near Bolaños, *Rose* 2967.

OAXACA: Eighteen miles northeast of Oaxaca, *Nelson* 1362 (type).

3. Minkelersia multiflora Rose, Contr. U. S. Nat. Herb. **5**: 142. 1897.

The specimens examined are all in the National Herbarium.

MEXICO: Valley of Mexico, *Pringle* 6471 (type); *Bourgeau* 576. El Oro, *Pringle* 9551a. Tolma, *Rose & Painter* 6884, 6771. Guadalupe, *Rose & Painter* 7299.

MORELOS: El Parque, *Orcutt* 3835; *Rose & Painter* 7228.

OAXACA: Cumbre de Istepec, *Liebmann* 5317.

WITHOUT DEFINITE LOCALITY: *Dugès*.

4. Minkelersia vulcanica Piper, sp. nov.

Stems erect (?), terete, pubescent with spreading hairs; stipules ovate, obtuse, pubescent beneath, 9-nerved, 6 mm. long; petioles pubescent, shorter than the leaflets; leaflets ovate, acute, rounded at base, pubescent on both sides, 2 to 2.5 cm. long; peduncles bearing racemes of 12 to 20 flowers; bracts like the stipules; pedicels shorter than the calyx; bracteoles wanting; calyx 10 mm. long, the tube campanulate, minutely pubescent, the lanceolate acutish lobes subequal, twice as long as the tube; corolla 14 mm. long; standard orbicular; keel with two and one-half close coils.

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[1] Contr. U. S. Nat. Herb. **5**: 142. 1897.

Type in the herbarium of the Muséum d'Histoire Naturelle, Paris, collected on the Volcano Batea, Mexico, 2,000 to 2,200 meters altitude, in 1872, by M. E. Guillemin-Tarayre.

The specimen is fragmentary, consisting of two racemes, one of them bearing a single leaf. The species is nearest *M. multiflora* Rose, from which it is at once distinguished by the pubescence.

ALEPIDOCALYX

Alepidocalyx Piper, gen. nov.

Perennial from a globose tuber; stems erect or twining above, 15 to 60 cm. high; leaves pallid, rather thickish; bracteoles wanting; petals long-stipitate; callosity on the standard transverse; otherwise as in *Phaseolus*.

Type species, *Phaseolus parvulus* Greene.

This genus is intermediate between *Phaseolus* and *Minkelersia*. As in all but one of the species of *Minkelersia*, the bracteoles are absent. If *Alepidocalyx* be merged into *Phaseolus*, *Minkelersia* could hardly be consistently maintained.

KEY TO THE SPECIES

Leaflets ovate; caylx teeth very obtuse ..... **1. A. amblyosepalus.**
Leaflets lanceolate; calyx teeth acute or acutish.
  Bracts deciduous, small; stipules small ..... **2. A. parvulus.**
  Bracts persistent, larger; stipules larger ..... **3. A. anisophyllus.**

1. Alepidocalyx amblyosepalus Piper, sp. nov.

Tuber globose, 1 cm. in diameter; stems erect, thick, 15 cm. high, densely puberulent with somewhat reflexed hairs; leaves few; stipules ovate, obtuse, striate-nerved, nearly glabrous, 5 to 10 mm. long; petioles minutely puberulent, a little longer than the leaflets; leaflets ovate, obtuse, truncate at base, 3-nerved, minutely strigillose on both sides, 1.5 cm. long; peduncles puberulent, 2 to 3 times as long as the leaves; racemes 1 to 3 flowered; bracts broadly oval, 5 mm. long; pedicels densely puberulent, 2 mm. long; calyx campanulate, puberulent at base, 3 mm. long, the broad upper lip emarginate, the lower lip with 3 broad rounded lobes, shorter than the tube; corolla violet, 10 mm. long.

Type in the U. S. National Herbarium, no. 1,013,387 in part, collected in the State of Durango, Mexico, by P. Ibaña García (no. 456 in part). The type specimen consists of but a single plant.

2. Alepidocalyx parvulus (Greene) Piper.

Phaseolus parvulus Greene, Bot. Gaz. **6**: 217. 1881.

New Mexico and Arizona, southward into Mexico.

3. Alepidocalyx anisophyllus Piper, sp. nov.

Stems twining, terete, glabrous, 30 cm. high; stipules oblong, acute, glabrous, nerved, 8 to 10 mm. long; petioles glabrous, about as long as the leaflets; stipels lanceolate, acute, 2 to 3 mm. long; petiolules puberulent; leaflets lance-oblong, the lateral ones usually with a lobe on the outer side near the base, obtuse and apiculate at apex, glabrous, 2 to 6 cm. long; peduncles (in fruit) exceeding the leaves, few (3 to 5) flowered, minutely retrorse-puberulent; bracts ovate, acute, nerved, persistent, 3 to 4 mm. long; calyx campanulate, puberulent, the lobes acute; pods linear, compressed, 3 cm. long, 4 mm. wide, glabrous, short-beaked, 6-seeded; seeds ellipsoid-cylindric, 4 mm. long, reddish brown, shiny; hilum minute, circular.

Type in the U. S. National Herbarium, no. 332953, collected on Mount Mohinora, Chihuahua, Mexico, September 1, 1898, by E. W. Nelson (no. 4911). The specimen is in ripe fruit.

PHASEOLUS

Phaseolus is the largest and most complex genus in the group. No extensive treatment of the genus is more recent than those of Bentham in 1840 (Ann. Wien. Mus. Naturg. **2**: 136–142) and in 1859 (in Mart. Fl. Bras. **15**[1]: 180–191). Since then many isolated species have been proposed, and in various floras of limited areas the native species have been considered.[1]

Nearly all the species of *Phaseolus* show great variation in the form of the leaflets. Very commonly these will range from broadly ovate to lanceolate or to linear in the same species; or from entire to lobed, usually by production of the basal angles, that is, hastate or 3-lobed. Such variants are scarcely worthy of taxonomic recognition. Of more significance are the bracts, which in some species may be either long or short.

Many species and subspecies have been based on leaflet form or on slight differences in pubescence, characters which in *Phaseolus* are decidedly untrustworthy.

The relationships of the different groups in the genus are not very clear. For the present the groups established by Bentham are in the main recognized, but it is probable that the difference between a curled keel and a coiled keel is of greater significance than are the calyx characters.

KEY TO THE SECTIONS OF PHASEOLUS

Keel loosely curled like the letter S---------- **Sigmoidotropis.**
Keel coiled in one or more close turns.
  Stipules produced. Corolla yellow or yellowish.
    Left keel petal with a lateral hornlike process; annuals (Old World). **Ceratotropis.**
    Left keel petal without process; perennials (American)------ **Lasiospron.**
  Stipules not produced.
    Calyx subtubular. Wings much elongated---------- **Macroptilium.**
    Calyx campanulate.
      Flowers small; calyx teeth subequal, as long as or longer than the tube. **Microcochle.**
      Flowers middle-sized to large; calyx teeth unequal or all shorter than the tube.
        Keel tip coiled into 5 to 7 turns---------- **Cochliasanthus.**
        Keel tip coiled into 1 to 3 turns.
          Calyx tube not longer than at least the ventral tooth--- **Leptospron.**
          Calyx tube longer than the teeth---------- **Euphaseolus.**

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[1] Since this paper has been in press there has appeared a review of the South American species of Phaseolus by E. Hassler (Candollea **1**: 417–472. 1923), based largely on the rich herbarium material available at Geneva. Some of the conclusions reached in the present paper were anticipated by Hassler, and these are acknowledged in the appropriate places. Some recently proposed species are not included in Hassler's paper.

PHASEOLUS: SECTION SIGMOIDOTROPIS

This section of *Phaseolus* seems a natural assemblage, and is distinguished by the loose S-form of the keel. Most of the species are large-flowered and showy. Bentham included this group of species in *Euphaseolus*, but it seems preferable to limit that section to species with the keel closely coiled. *Sigmoidotropis* embraces the following species: *P. speciosus* H. B. K., *P. grandiflorus* Steud., *P. pius* Mart., *P. firmulus* Mart., *P. appendiculatus* Benth., *P. cochleatus* Vell., *P. vignoides* Rusby, *P. antillanus* Urban, *P. peduncularis* H. B. K., *P. clitorioides* Mart., and probably *P. obliquifolius* Mart. and *P. latidenticulatus* Harms, besides the following new species here described: *P. elegans, P. pulchellus, P. robustus, P. megatylus, P. halophilus, P. ligulatus.* *Phaseolus speciosus* H. B. K., a common species, may be considered typical of the section, and most of the other species resemble it closely.

Phaseolus peduncularis H. B. K. and *P. antillanus* Urban are referred by Fawcett and Rendle (Fl. Jam. **4**: 68–69. 1920.) to *Vigna*. Such a course would logically involve the same reference for all the species of the section here discussed. It would perhaps be better to consider *Sigmoidotropis* as a genus, even if largely on the basis of convenience.

Phaseolus speciosus H. B. K. Nov. Gen. & Sp. **6**: 452. 1823.

This species, originally described from the Orinoco River, ranges through much of Mexico, throughout Central America, to Colombia, Ecuador, and Venezuela.

Phaseolus elegans Piper, sp. nov.

Stems terete, glabrous, rather woody; stipules narrowly triangular, acute, 4 mm. long, strongly 7-nerved; petioles slender, shorter than the leaflets; stipels, oblong, obtuse, 2-nerved; leaflets membranous, narrowly ovate, gradually acuminate, rounded at base, glabrous, 4 to 6 cm. long; calyx 6 mm. long, broadly campanulate, glabrous or nearly so, the upper lip short and emarginate, the lower lip with broadly lanceolate, acutish lobes as long as the tube; corolla purple, 2 cm. long and broad; keel tubular, strongly curved, curled into nearly a complete turn; pod linear, glabrous, straight, 10 to 16 cm. long, 5 mm. wide, tipped with a long straight beak; seeds ellipsoid, compressed, ochraceous speckled with black, 5×3×1 mm.; hilum small, central, white, encircled by a black border.

Type in the U. S. National Herbarium, no. 427961, collected in the vicinity of Mona Mountain, near Kingston, Jamaica, April 29, 1903, by William R. Maxon (no. 1666).

JAMAICA: Without special locality, *March* 399 (G), 1645 (K).

HONDURAS: San Pedro Sula, *Thieme* 5203 (G, N).

YUCATÁN: Izamal, *Gaumer* 450 (N, Mo., F), 525 (F). Lake Chichankanab, *Gaumer* 23665 (F). Kancabonat, *Gaumer* 23534 (F). San Anselmo, *Gaumer* 1823 (F). Encina de Sisal, *Schott* 882 (F). Sayi, *Seler* 3892 (F).

Closely allied to *P. speciosus* H. B. K., and perhaps to be considered merely a glabrous subspecies.

Phaseolus pulchellus Piper, sp. nov.

Vine, herbaceous or perhaps somewhat woody; stems terete, glabrous; petioles shorter than the leaflets; stipules oblong, rather firm, 3 mm. long; stipels oblong, 3-nerved, 2 mm. long; leaflets rhomboic-ovate, broadly cuneate at base, long-

acuminate to a blunt apiculate tip, sparsely strigillose on both surfaces; peduncles stout, 10 cm. long, the pedicellar glands large; pedicels very short, 2 mm. long; bracts oblong, strongly 5-nerved, 2 mm. long; bracteoles not seen; calyx campanulate, 6 mm. long, glabrous, the margin thin and paler, the short upper lip emarginate, the lower lip with 3 broadly triangular obtuse teeth about one-fourth as long as the tube; corolla 3 cm. long; standard orbicular, emarginate, reflexed from above the middle; wing broadly oblanceolate; keel loosely curled in less than one complete turn.

Type in the U. S. National Herbarium, no. 860619, collected at Semacoch, Alta Verapaz, Guatemala, March 8, 1905, by George P. Goll (no. 264).

The single complete flower was not dissected.

Phaseolus appendiculatus Benth. Ann. Wien. Mus. Naturg. **2**: 137. 1840.

?*Phaseolus candidus* Vell. Fl. Flum. 311. *pl. 125*. 1825.

Phaseolus membranaceus Benth. Ann. Wien. Mus. Naturg. **2**: 137. 1840.

Phaseolus amplus Benth. Bot. Voy. Sulph. 85. 1844.

All the above seem to represent forms of one species, which occurs in Colombia, Venezuela, Brazil, Peru, Bolivia, Uruguay, and Paraguay. The type of *P. amplus* is said to be from Central America.

Hassler accepts Vellozo's name, which is based upon a plant collected near Rio de Janeiro, but imperfectly described and badly figured.

Phaseolus clitorioides Mart. Ann. Wien. Mus. Naturg. **2**: 137. 1840.

Phaseolus oblongifolius Micheli, Mém. Soc. Phys. Hist. Nat. Genève, **28**: 27. 1883.

This species occurs in Brazil and Paraguay. Hassler considers it a variety of *P. peduncularis* H. B. K. (*P. peduncularis* var. *clitorioides* Hassler, Candollea **1**: 435. 1923).

Phaseolus megatylus Piper, sp. nov.

Woody-stemmed vine; stems terete, pubescent with short pale spreading hairs; stipules broadly oblong, obtuse, thick, striate, pubescent beneath, 5 mm. long; petioles pubescent like the stems, shorter than the leaflets; stipels oblong, obtuse, 2 mm. long; leaflets membranaceous, ovate, the lateral very oblique, acuminate and long-apiculate, rounded or subcordate at base, densely soft-pubescent on both sides, 3-nerved, 6 to 8 cm. long; peduncles stout, 20 to 25 cm. long, floriferous on the upper part; pedicellar glands very large, 1 to 3 cm. apart in fruit; pedicels about as long as the calyx; bracts not seen; bracteoles oval, 7 to 9 striate, pubescent, one-third as long as the calyx; calyx campanulate, pubescent, ciliate, 10 mm. long, the broad upper lip notched, the 2 lower teeth oblique-ovate, obtuse, shorter than the tube, the median tooth triangular, acute as long as the tube; corolla violet(?), 3 cm. long; standard orbicular, emarginate, short-stipitate; keel in one nearly complete, loose spiral; stigma globose, on the ventral side at the tip, encircled at base by a ring of hairs, and below a short naked interspace, the style densely bearded with long hairs for 2 mm.; pod (immature) appressed-pubescent, 14 cm. long, the straight beak 1.5 cm. long.

Type in the U. S. National Herbarium, no. 604818, collected at Santa Ana, Peru, altitude 900 meters, July 4, 1915, by O. F. Cook and G. B. Gilbert (no. 1634). Also collected at Chachapoyas, *Matthews* 3260 (K).

Owing to the half-decayed condition of the flowers, complete dissection was not successful.

Phaseolus halophilus Piper, nom. nov.

Phaseolus membranaceus var.? *maritimus* Benth. in Mart. Fl. Bras. **15**[1]: 184. 1840. Not *P. maritimus* Benth. 1840.

Stems slender, glabrous or nearly so; leaflets 3, thickish, broadly ovate, obtuse to acute, truncate to rounded at base, glabrous, 4 cm. long and nearly as broad

sometimes obscurely 3-lobed; peduncles stout, sparsely strigose, 15 to 20 cm. long; raceme short, 6 to 20 flowered; calyx narrowly campanulate, sparsely strigillose, 8 mm. long, the upper lip emarginate, the lower with 3 oblong-ovate obtuse ciliate teeth; bracteoles oblong, obtuse, strongly 7-nerved, half as long as the calyx; corolla 15 mm. long; keel loosely twisted in a single turn; pods linear, with prominent marginal ridges, sparsely puberulent, compressed, nearly straight, 9 cm. long, the straight slender beak 1.5 cm. long.

Type in the herbarium of the Royal Botanic Gardens, Kew, collected in maritime marshes near Bahia, Brazil, by Salzmann; duplicate in the herbarium of the Missouri Botanical Garden.

Readily distinguished from *P. appendiculatus* Benth. by its very different leaflets, smaller, rather crowded flowers, and broader pods.

Phaseolus vignoides Rusby, Bull. N. Y. Bot. Gard. 4: 345. 1907.

This species is apparently confined to Bolivia. Besides the type collected at Corioco, *Rusby* 2328, it has been found at Asolo, *Williams* 1472, and Sacramento, Yungas, *Bang* 2382.

Phaseolus cochleatus Vell. Fl. Flum. 312. 1825.

Hassler (Candollea **1**:426. 1923) considers that Vellozo's name refers to *P. caracalla*, but although the descriptions and figures are poor, the species appears valid and is represented by the following two specimens:

BRAZIL: Province Sao Paulo, *Weir* 472 (K). Rio de Janeiro, *Glaziou* 11875 (K).

Phaseolus ligulatus Piper, sp. nov.

Perennial, herbaceous, from a thick vertical root, glabrous up to the inflorescence; stems slender, terete, somewhat angled, apparently twining above, 60 to 90 cm. high; stipules firm, oblong-ovate, acute, strongly 11 to 15 nerved, 5 to 7 mm. long; petioles slender, about as long as the leaflets; stipels broadly linear, acute, curved, 5-nerved, 3 mm. long; leaflets 3, rather firm, long-linear, attenuate to an obtuse apiculate tip, 3-nerved at base, reticulate-veined, nearly sessile, 8 to 10 cm. long, 3 to 7 mm. wide; peduncles exceeding the leaves; raceme rather densely few-flowered, the rachis strigillose; pedicellar glands prominent; pedicels as long as the calyx; bracts lanceolate, acute, 5-nerved, 2 mm. long; bracteoles oblong, obtuse, 13-nerved, as long as the calyx tube; calyx campanulate, nearly glabrous, the short upper lip emarginate, the lateral teeth broadly triangular, acute, half as long as the tube, the median tooth subulate, as long as the tube; corolla violet, 13 mm. long; standard orbicular, not reflexed, short-stipitate; keel tubular, loosely curled into nearly a complete turn; pods not seen.

Type in the U. S. National Herbarium, no. 1,192,596, collected at Ixiamas, Bolivia, altitude 240 meters, December 19, 1921, by O. E. White (no. 2000).

Phaseolus robustus Piper, sp. nov.

Herbaceous, densely short-tomentose on the stems, petioles, and under surfaces of the leaves; stems stout, terete; stipules oblong, obtuse, 4 mm. long; petioles about as long as the leaflets; stipels oblong, obtuse, 1 mm. long; leaflets membranaceous, broadly ovate, acuminate, rounded at base, densely canescent-tomentose beneath, strigose and greener above, 6 to 10 cm. long, the lateral ones larger than the median; peduncle stout, bearing about 15 flowers; pedicels shorter than the calyx; calyx campanulate, densely tomentose, 5 to 6 mm. long, the short upper lip emarginate, the lower lip with 3 triangular acutish teeth shorter than the tube; corolla apparently purple; standard 2 cm. broad, 1.5 cm. long, notched at apex, thickened near the auricled base, the stipe stout and longer than the sinus; wings obovate, 2 cm. long, incurved at the margin, not auricled at the stipitate base; keel curved into a nearly complete, loose spiral; free stamen thickened at base, but not geniculate; immature pod densely white-tomentose, 1.5 cm. long.

Type in the herbarium of the Royal Botanic Gardens, Kew, collected at San Antonio, near Petropolis, in the vicinity of Rio de Janeiro, Brazil, November, 1879, by M. Glaziou (no. 10566).

Readily distinguished from any related species by the dense close tomentum. It was called *Pachyrhizus angulatus* Rich. by Glaziou (Mém. Soc. Bot. France **3b**: 141. 1906).

On account of the rather scanty material, a flower was not dissected.

Phaseolus grandiflorus Steud. Nom. Bot. ed. 2. **2**: 817. 1841.

Phaseolus violaceus Vell. Fl. Flum. 311. *pl. 124*. 1825.

This seems a valid species, represented by *Glaziou* 5823, collected near Rio de Janeiro. This is the only species in the group with the lower calyx lip longer than the tube. Vellozo's description calls for a spirally twisted keel, but one of the figures shows it as sigmoid. Hassler considers it a variety of *P. linearis* H. B. K. (*P. linearis* var. *violaceus* Hassler, Candollea **1**: 445. 1923).

PHASEOLUS: SECTION COCHLIASANTHUS

This name was long ago proposed for *Phaseolus caracalla* L. (Trew. Pl. Rar. 14. *pl. 10*. 1763). The section contains but two known species, *P. caracalla* L. and *P. lobatus* Hook.

KEY TO THE SPECIES

Leaflets entire ..... **P. caracalla** L.
Leaflets 3-lobed ..... **P. lobatus** L.

Phaseolus caracalla L. Sp. Pl. 725. 1753.

Phaseolus caracallensis St. Lag. Ann. Soc. Bot. Lyon **7**: 131. 1880.

Phaseolus bertonii Franceschi, Anal. Cienc. Paraguay **2**: 139. 1918.

Phaseolus longirostratus Ducke, Arch. Jard. Bot. Rio Janeiro **3**: 174. 1922.

This species is known to occur as a native in Brazil, Bolivia, Paraguay, Argentina, and perhaps in Guatemala (Suchitepéquez, *Shannon* 565) and Mexico (Durango, *Palmer* 289). It is widely cultivated as an ornamental. The form cultivated in California is like that wild in Paraguay and is the basis of *P. bertonii* Franceschi. In the light of the material at hand it does not seem sufficiently distinct.

Phaseolus lobatus Hook. in Curtis's Bot. Mag. **70**: *pl. 4076*. 1844.

URUGUAY: Banda Oriental (Río Negro), *Tweedie*, type. Without locality, *Herb. Parker* 63 (G).

Reported from Rondoma, Matto Grosso, Brazil, *Kuhlmann* 2019.

Phaseolus lobatus Roxb. (in Wight & Arn. Prodr. Fl. Ind. **1**: 427. 1834) is merely mentioned in synonymy.

The Parker specimen has nearly mature pods. These are linear, glabrous, compressed, 8.5 cm. long, tipped with a slender straight beak; seeds ellipsoid, 7×4×2 mm., dark reddish and marbled, the linear hilum two-thirds as long as the seed.

PHASEOLUS: SECTION LASIOSPRON

This group of perennials is well marked by the yellow flowers and produced stipules.

KEY TO THE SPECIES

Herbage densely pubescent, velutinous to villose or densely or sparsely strigose; pods terete, thick-valved, densely hirsute; seeds strophiolate. **P. hirsutus.**
Herbage sparsely pilose; pods compressed, thin-valved, sparsely pilose; seeds not strophiolate.

Leaflets oblong to ovate, nearly glabrous; calyx 2 mm. long__ **P. campestris.**
Leaflets lanceolate to ovate, acute; calyx 3 to 4 mm. long____ **P. schottii.**

Phaseolus hirsutus Mart.; Benth. Ann. Wien. Mus. Naturg. **2**: 140. 1840.
Phaseolus lasiocarpus Mart.; Benth. Ann. Wien. Mus. Natur **2**: 140. 1840.
Phaseolus balansae Micheli, Mém. Soc. Phys. Hist. Nat. Genève, **28**: 29. 1883.
Phaseolus lasiocarpus balansae Chod. & Hassl. Bull. Herb. Boiss. II. **4**: 909. 1904.
Phaseolus lasiocarpus igatimianus Chod. & Hassl. Bull. Herb. Boiss. II. **4**: 909. 1904.

This widespread species ranges from Mexico to Argentina. It is highly variable as to both leaf contour and pubescence, but in all forms has the blunt calyx lobes nearly as long as the tube. The leaflets vary from oblong-linear to lanceolate and broadly ovate, usually obtuse but sometimes acute or even acuminate. The herbage may be nearly glabrous, as in *Burchell* 9358, puberulent-tomentose, as in *Fiebrig* 6177 and *Pittier* 2347, villose, as in *Pennell & Killip* 8328, or hirsute, as in *Pittier* 5225. Strophiolate seeds are known in no other species. The southernmost forms tend to have broad leaflets and short-tomentose pubescence.

Mexico: Laguna de Curahueso, Tabasco, *Rovirosa* 442 (K, N).

Panama: San Felix, *Pittier* 5225 (N). Gorgona to Mamei, *Pittier* 2247 (N, L). Río Tecumen, *Standley* 2669 (N). Red Tank to Pueblo Nuevo, *Piper* 5170 (N).

Colombia: Villavicencio, *Sprague* 100 (K). Aganche, Cauca River, *Pennell & Killip* 8328 (Y, N).

Trinidad: *Crueger* (K).

British Guiana: Demerara, *Parker* (K). Numatta, *Jenman* 5506 (K). Kotinga Valley, *Quelch & McConnell* 177 (K). Riverside, *Pollard* 54 (K). Courantyne River, *im Thurm* (K). Without locality, *Schomburgk* 715 (L), 116 (K), 413 (P).

Brazil: Obidos, *Spruce* 467 (K). San Carlos, Rio Negro, *Spruce* 3677 (K). Isle Marajo, Pará, *Huber* 2682 (L). Bos Cuyaba, *Robert* 705a (L). Without locality, *Sellow* (K). Sao Joao, *Burchell* 9258 (K, Y; leaflets ovate, thin, nearly glabrous). Rio de Janeiro (cultivated), *Glaziou* 9721, 9722 (K). Curunta, Matto Grosso, *Moore* 1001 (L).

Paraguay: Asunción, *Balansa* 1548 (K; type of *P. balansae*). Alto Paraná River, *Fiebrig* 6177 (L, K, N). Río Y-Aca, *Hassler* 6828 (K, L). Igatim, *Hassler* 5535 (K; type of var. *igatimianus*). Sierra de Amambay, *Hassler* 10147 (L).

Argentina: Formosa, *Jörgensen* 2959 (Mo.).

Phaseolus pilosus H. B. K. Nov. Gen. & Sp. **6**: 453. 1823.

The type specimen in the herbarium of the Muséum d'Histoire Naturelle, Paris, is a very poor specimen, as indeed is noted in the original description. The best match for it in the Paris herbarium is *Schomburgk* 413 from British Guiana. Apparently it can not be differentiated from *Phaseolus hirsutus* Mart. If this be true, *Phaseolus pilosus* H. B. K. must be adopted as the name of the species, a conclusion reached by Hassler (Candollea **1**: 465. 1923).

Phaseolus campestris Mart. Ann. Wien. Mus. Naturg. **2**: 141. 1840.
Phaseolus juruanus Harms, Notizbl. Bot. Gart. Berlin **7**: 506. 1921.
Phasedus schottii campestris Hassler, Candollea **1**: 464. 1923.

This species occurs in British Guiana, Brazil, and perhaps Honduras (a somewhat doubtful specimen, Tela River near Puerto Sierra, *Wilson* 669; Y).

Phaseolus schottii Benth. Ann. Wien. Mus. Naturg. **2**: 139. 1840.
Phaseolus longifolius Benth. Ann. Wien. Mus. Naturg. **2**: 139. 1840.
Phaseolus ovatus Benth. Ann. Wien. Mus. Naturg. **2**: 139. 1840.

Phaseolus ovatus glabratus Benth. in Mart. Fl. Bras. **15**[1]: 188. 1859.
Phaseolus trichocarpus Wright in Sauvalle, Fl. Cub. 30. 1873.
Phaseolus lanceolatus Bello, Anal. Soc. Esp. Hist. Nat. **10**: 262. 1881.

All the above names seem clearly to represent a single species with the leaflets varying from lanceolate to broadly ovate. The first name has priority of position, and since the other two of the same date are misleading as to the character of the species, the first is here adopted. The species occurs in Cuba, Porto Rico, Guiana, Bolivia, Brazil, and Paraguay.

PHASEOLUS: SECTION MICROCOCHLE

This group is characterized by having small flowers and the campanulate calyx somewhat equally five-lobed, the lobes about as long as the tube.

KEY TO THE SPECIES

Leaflets parted into linear lobes; cleistogamous flowers present_ **P. pedatus** Rose.
Leaflets entire; cleistogamous flowers none.
  Plants low, not twining.
    Calyx lobes triangular, as long as the tube_____ **P. fraternus** Piper.
    Calyx lobes subulate, longer than the tube_____ **P. heterophyllus** Willd.
  Plants slender, twining.
    Leaflets orbicular. Peduncles elongate_____ **P. sabaerensis** Hoehne.
    Leaflets ovate.
      Peduncles short; leaves densely pubescent_____ **P. psammodes** Lindm.
      Peduncles long; leaves thinly pubescent_____ **P. acariaeanthus** Harms.

Phaseolus pedatus Rose, Contr. U. S. Nat. Herb. **8**: 48. 1903.

In the original description the fact was overlooked that this species produces subterranean pods from cleistogamous flowers. These flowers are smaller than the normal ones and pale yellowish, like the roots. The pods are linear, very short-beaked, tumid, glabrous, white, 2 or 3 seeded, 5 to 7 mm. long. The seeds are pale brown, smooth, dull, oval, somewhat compressed, 2 mm. long, the hilum small and circular. Mature pods of the petaliferous flowers have not been seen. The young pods are linear, glabrous, and long-beaked.

Phaseolus fraternus Piper, sp. nov.

Perennial from a thick oblong tuber; stems herbaceous, spreading or ascending, slender, 30 to 50 cm. long, pilose, the hairs somewhat yellow; stipules broadly lanceolate, acuminate, pubescent, 7-nerved, 5 to 7 mm. long, persistent; petioles about as long as the leaflets, pilose; stipels subulate, 2 mm. long; leaflets 3, oval, acute, broadly cuneate to rounded at base, 2 to 3 cm. long, sparsely appressed-pilose, usually entire but the basal angles sometimes produced into rounded lobes; peduncles much exceeding the leaves, pubescent with retrorse hairs; racemes short, dense, 5 to 8 flowered; pedicels very short; bracts lanceolate, pubescent, 1-nerved, 2 mm. long; bracteoles subulate, pubescent, less than half as long as the calyx; calyx obconic, pubescent, 3 mm. long, the upper lip bidentate, the lanceolate teeth nearly as long as the tube, the lower lip with 3 narrowly triangular attenuate subequal teeth as long as the tube; corolla 5 mm. long; standard orbicular, reflexed at the middle; pods sessile, linear, compressed, hirtellous, short-beaked, 4 to 6 seeded, 20 to 25 mm. long; seeds oval in outline, compressed, smooth, brown, 3 mm. long, the short hilum central.

Type in the U. S. National Herbarium, no. 942260, collected on the plateau of Bolivia in 1891 by Miguel Bang (no. 1011). The same collection is represented in the Gray Herbarium and in the herbarium of the Missouri Botanical Garden.

The following specimens also are referred to this species:

PERU: Without locality, Ruiz & Pavón (L).

PARAGUAY: Cerros de Tobaty, *Hassler* 6380 (K). Without definite locality, *Hassler* 1099 (K). Duarte near Carapegua, *Hassler* 1239 (K, Y).

URUGUAY: Without definite locality, *Tweedie* (K).

Very similar to *P. heterophyllus* H. B. K. The characters here relied upon as specific are the acute leaflets and the triangular, not subulate, shorter calyx lobes.

Phaseolus heterophyllus Willd. Enum. Pl. Hort. Bot. Berol **2**: 753. 1809.

Phaseolus parviflorus Schlecht. Linnaea **12**: 325. 1838.

?*Phaseolus macropus* Benth. Ann. Wien. Mus. Naturg. **2**: 140. 1840.

Phaseolus micranthus Mart. & Gal. Bull. Acad. Brux. **10**[2]: 196. 1843.

Phaseolus bilobatus Engelm. in Wisliz. Mem. North. Mex. 109. 1847.

Phaseolus macropoides A. Gray, Pl. Wright. **2**: 33. 1852.

This very variable species ranges from Arizona and New Mexico southward through Mexico into Guatemala. The original specimens of Humboldt and Bonpland from Valladolid (Morelia) have faintly lobed, linear-oblong leaflets, and those of the type of *P. micranthus*, from the Cordillera of Oaxaca, are very similar. The leaflets vary from entire and linear to entire and orbicular, but more commonly are basally 2 or 3 lobed. The plant is perennial from a deep-seated oblong tuber. The pods vary from hispidulous to hirtellous.

Phaseolus heterophyllus rotundifolius (A. Gray) Piper.

Phaseolus rotundifolius A. Gray, Pl. Wright. **2**: 34. 1834.

The only character by which this may be distinguished is the villous pubescence of the pods, but even this seems to break down, since both hirtellous pods and villous pods occur in Pringle's 359. The leaflets are usually orbicular and entire, but range to oblong, and in either form may be lobed. The following specimens, all in the U. S. National Herbarium, belong here:

NEW MEXICO: Organ Mountains, *Wooton* 536; September 28, 1902, *Wooton;* September 17, 1893, *Wooton*. Mogollon Mountains, *Rusby* 2017.

ARIZONA: Mexican border, *Pringle* 359. Fort Huachuca, *Wilcox* 284. Santa Rita Mountains, *Griffiths & Thornber* 295. Bowie, *Jones* 592, 4304.

MEXICO: Fronteras, Sonora, *Hartman* 24. Casas Grandes to Sabinal, Chihuahua, *Nelson* 6372. Jaral, *Schumann* 198.

PHASEOLUS: SECTION MACROPTILIUM

This is a well-marked group of species, all native to America. Two new species are here described, and some changes are made due to synonymy.

Phaseolus rubidus Piper, nom. nov.

Phaseolus rufus Micheli, Mém. Soc. Phys. Hist. Nat. Genève **28**: 29. 1883. Not *P. rufus* Jacq. 1770.

Hassler regards this plant as a variety of *P. monophyllus* Benth. (*P. monophyllus* var. *rufus* Hassler, Candollea **1**: 449. 1923), a conclusion with which I do not agree.

Phaseolus gracilis Poepp.; Benth. Ann. Wien. Mus. Naturg. **2**: 141. 1840.

Phaseolus savannarum Britt. & Wils. Mem. Torrey Club **16**: 70. 1920.

P. gracilis Poepp. and *P. longepedunculatus* Mart. are apparently extreme forms of a single species, intermediate examples being plentiful. *P. gracilis* has "priority of position." Originally described from Cuba, it occurs also in Isle of Pines, Mexico, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Guiana, and perhaps Paraguay.

Phaseolus atropurpureus DC. Prodr. **2**: 395. 1825.

Phaseolus schiedeanus Schlecht. Linnaea **12**: 323. 1838.

Phaseolus canescens Mart. & Gal. Bull. Acad. Brux. **10**[2]: 196. 1843.

Phaseolus dysophyllus Benth. Pl. Hartw. 287. 1848.

Phaseolus atropurpureus sericeus A. Gray, Proc. Amer. Acad. **5**: 156. 1861.
Phaseolus semierectus atropurpureus Gómez, Anal. Hist. Nat. Madrid **23**: 255. 1894.

This very variable species occurs rarely in extreme southern Texas, and abundantly throughout Mexico, Guatemala, and Salvador. The numerous Mexican and Central American specimens are not cited here.

New Mexico: Donana, *Parry, Bigelow, Wright & Schott* (N).

Texas: Cibola Canyon, *Havard* 43, 44 (G). Cibola of Rio Grande, *Bigelow* 210 (G).

The leaflets range from entire and lanceolate to entire and orbicular, but more frequently are lobed, the lobes shallow or deep, acute or obtuse. The pubescence is always canescent, usually thin and appressed, but often denser and sericeous, as in specimens from the west coast of Mexico (var. *sericeus* A. Gray).

Phaseolus vestitus Hook. Bot. Misc. **2**: 216. 1831.

It is very doubtful if this can be kept distinct from *P. atropurpureus* DC., but there is a gap between the ranges of the two, namely, from Salvador to southern Colombia. Hassler, perhaps correctly, reduces this to varietal rank under *P. atropurpureus*.

Peru: Lurin near Lima, *Matthews* (K; type). Lima, *Cuming* 1087 (K). Tarapoto, *Spruce* 4852 (G). Chosica, *Holway* 783½ (N); *Macbride & Featherstone* 526 (F). Callao, *Wilkes Expedition*.

Ecuador: Jervis Island, Galápagos, *Baur* 86 (G).

Colombia: Pasto, *Triana* (K).

Phaseolus scolecocarpus Piper, sp. nov.

Herbaceous vine; stems slender, terete, pilose with yellowish hairs; stipules subulate, attenuate-acuminate, strongly 5-nerved, pubescent, 6 mm. long; petiole slender, longer than the leaflets, rusty-pilose; stipels subulate; leaflets membranous, oblong-ovate, obtuse and apiculate, rounded at base, densely pubescent on both sides, 3 cm. long; small tufts of bractlike phyllomes at the base of the peduncles and in the leaf axils, these like the stipules but narrower; peduncles pilose, much exceeding the leaves, 10 to 20 cm. long, bearing at the tip a rather close spike of 8 to 10 flowers; flowers sessile; bracts subulate, 3-nerved, pubescent, 4 mm. long; bracteoles subulate, 1-nerved, as long as the calyx tube; calyx turbinate, rusty-pubescent, 5 mm. long, the upper lip with 2 broadly triangular, acute teeth, the lower with 3 narrowly triangular teeth over half as long as the calyx tube; corolla purple, 12 to 15 mm. long; standard 10 mm. long, the upper portion orbicular, reflexed, the basal portion deltoid, without auricles or callosities; wings 15 mm. long, the oblong blade twice as long as the stipe, not auricled; keel 10 mm. long, tubular, the tip in one close coil; style with a sparse short beard just below the stigma; stigma lateral, roundish; filament of free stamen gradually enlarged at base; ovary linear, puberulent; pod linear, pendent, more or less contorted, stipitate, the stipe as long as the calyx, pubescent, long-beaked, 10 to 12 seeded, tipped with the shrunken corolla; seeds ellipsoid, brown speckled with black, 3 × 2 × 1 mm., the very small hilum central, surrounded by a black border.

Type in the herbarium of the Field Museum of Natural History, no. 37272, collected at Izamal, Yucatán, Mexico, by G. F. Gaumer (no. 924). The same collection is represented in the herbarium of the Missouri Botanical Garden.

Yucatán: Buena Vista, *Gaumer* in 1899 (F). Without locality, *Gaumer* 1670 (F).

Nearest related to *P. longepedunculatus* Mart. The plant was referred to *P. dysophyllus* Benth. by Millspaugh (Field Mus. Bot. **1**: 369. 1898).

Phaseolus affinis Piper, sp. nov.

Herbaceous vine; stems terete, pubescent with retrorse hairs; stipules triangular-lanceolate, attenuate, 7-nerved, pubescent beneath, 5 to 6 mm. long; petioles shorter than the leaflets; stipels subulate, 2 mm. long; leaflets oblong to ovate, obtuse, entire or faintly lobed at base, appressed-pubescent on both sides, not paler beneath, 3 to 5 cm. long; peduncles greatly elongate, 15 to 35 cm. long, puberulent, bearing at base a small tuft of bractlike phyllomes; inflorescence of 5 to 10 rather crowded, sessile flowers; bracts subulate, pubescent, 4 mm. long; calyx turbinate-campanulate, densely rusty-pubescent, 8 mm. long, the upper lip with 2 broad triangular acute teeth half as long as the tube, the lower lip with 3 narrower teeth nearly as long as the tube; bracteoles subulate, pubescent, half as long as the calyx; corolla 2 cm. long, "red turning blue"; standard broadly obovate, emarginate, reflexed above, 12 mm. long, the base deltoid, without auricles or callosities; wings 18 mm. long, the blade broadly obovate, incurved at the margins, without auricles, the slender stipe one-third as long as the blade; keel tubular, falcate, the tip in one complete close coil; style with a dense short beard separated by an interspace from the stigma; stigma lateral at the tip; anthers oblong, yellow; free filament gradually enlarged at base; ovary linear, silvery-sericeous; immature pods ascending, linear, densely pubsecent, short-beaked, 4 cm. long.

Type in the herbarium of the New York Botanical Garden, collected at El Tambo, near Ambato, Tungurahua, Ecuador, May, 1919, by A. Pachano (no. 248). A duplicate specimen is in the U. S. National Herbarium.

ECUADOR: Quito, *Jameson* (L). Pomasqui and San Antonio, *Jameson* 876 (L), 877 (K). Tamante, *Spruce* 5791 (K).

Closely allied to *P. atropurpureus* DC. and *P. longepedunculatus* Mart., but distinguished by characters of foliage and calyx, and by the larger flowers. *Spruce* 5791 is the type of *P. atropurpureus* var. *ecuadoriensis* Hassler (Candollea **1**: 458. 1923).

PHASEOLUS: SECTION CERATOTROPIS

This is a natural group of oriental annuals with yellow or yellowish flowers. Bentham included them in his section *Strophostyles*, which is in large part *Strophostyles* Meyer, but not at all *Strophostyles* Elliott, the latter commonly recognized as a valid genus. Only one species of this section has been considered to be American.

Phaseolus hernandezii Savi, Nuov. Giorn. Lett. **3**: 310. 1882.

Savi's detailed description and figures of the pod and seed of the plant he grew point unmistakably to the urd or urid, *Phaseolus mungo* L., not to the mung, *Phaseolus aureus* Roxb.

Savi was led to believe that his plant was a Mexican species by an unfortunate error. He cites "*Phaseolus orthocaulis Mungo persarum*, Hernández Rer. Medic. Novae. Hisp. Thes. p. 887 cum icone." This citation is really to a commentary entitled "Annotationes et Additiones" by Fabio Colonna and not written by Hernández himself. Colonna does not imply that the plant of which he gives a figure is a Mexican species, but apparently merely suggests that the mung might prove a valuable plant in Mexico. The details of the matter, as cleared up by the studies of Sir David Prain, may be found in a paper by C. V. Piper (The Name of the Soy Bean, Journ. Amer. Soc. Agron. **6**:75–84. 1914).

Phaseolus hernandezii Savi is therefore not founded on a Mexican plant at all, but on one which Savi cultivated and which he supposed to be the same as that described and figured by Fabio Colonna in his addition to Hernández's text. The name can be considered only as a synonym of the urd, *Phaseolus mungo* L.

PHASEOLUS COCCINEUS AND ITS ALLIES

There are several species with rather large scarlet flowers, rarely white or yellowish, that in general may resemble *Phaseolus coccineus* L., but all are perennials. These species may be thus distinguished:

KEY TO THE SPECIES

Bracteoles minute, much shorter than the calyx.
  Herbage glabrous, except the petioles; calyx glabrous, ciliate; ovary glabrous. **1. P. glabellus.**
  Herbage puberulent; calyx puberulent; ovary pubescent..... **2. P. griseus.**
Bracteoles not minute, usually as long or longer than the calyx.
  Bracteoles broadly elliptic to suborbicular, as broad as the calyx.
    Bracteoles pubescent, usually tomentose..... **3. P. obvallatus.**
    Bracteoles glabrous or nearly so..... **4. P. formosus.**
  Bracteoles oblong to elliptic, not nearly as broad as the calyx.
    Calyx and bracteoles glabrous.
      Bracteoles oblong, obtuse..... **5. P. leiosepalus.**
      Bracteoles lanceolate, acute..... **6. P. strigillosus.**
    Calyx puberulent or pubescent.
      Bracteoles about as long as the calyx.
        Bracts longer than the buds..... **7. P. polyanthus.**
        Bracts not longer than the buds..... **8. P. coccineus.**
      Bracteoles twice as long as the calyx.
        Primary bracts 10 mm. long, the secondary little shorter. **9. P. leucanthus.**
        Primary bracts 6 to 7 mm. long, the secondary ones minute. **10. P. flavescens.**

1. Phaseolus glabellus Piper, nom. nov.

Phaseolus glaber Schlecht. Linnaea **12**: 327. 1838. Not *P. glaber* Roxb. 1832.

VERACRUZ: Jalapa, *Schiede*, type collection (P); *Rose & Hay* 6105 (N); *Linden* 676 (K). Orizaba, *Bourgeau* 2919, 3173 (K, P); *Botteri* 738 (K, P).

SAN LUIS POTOSÍ: Los Caños, *Palmer* 216 in 1902 (N).

Palmer's specimen has mature fruits and a vertical woody root over 2 feet long, showing the plant to be perennial. Pods linear, curved, compressed, 4 cm. long, 6 mm. wide, the tip with a stout straight beak; seeds 6 to 8, oblong, slightly curved, gray thickly mottled with black, 4×3×1.5 mm.; hilum concave, median, oblong, white, 2 mm. long.

2. Phaseolus griseus Piper, sp. nov.

Herbaceous vine; whole herbage covered with fine grayish pubesence; stems slender, terete, pubescent with spreading hairs; leaves ample; stipules triangular, acute, striate, reflexed, somewhat pubescent, 3 mm. long; petioles puberulent, shorter than the leaves; stipels triangular-lanceolate, 3-veined, 2 mm. long; leaflets membranous, broadly ovate, acuminate and apiculate, rounded to truncate at base, 3-nerved, inconspicuously veined, minutely puberulent above, paler and densely puberulent beneath, 5 to 6 cm. long; bracts lanceolate, broadest at base, the primary ones 3 mm. long, persisting; pedicellar glands inconspicuous; pedicels sparsely puberulent, several times as long as calyx; bracteoles oblong, obtuse, 3 to 5 nerved, less than half as long as the calyx; calyx campanulate, minutely puberulent, the hairs longer ventrally, the very short upper lip entire, the lower with 3 broad triangular teeth much shorter than the tube; corolla crimson, 12 mm. long; ovary linear, densely canescent.

Type in the U. S. National Herbarium, no. 450954, collected near Guadalajara, Jalisco, Mexico, September 28, 1903, by Rose and Painter (no. 7369).

A fruiting plant collected by Holway (no. 5770, October 18, 1903) at Santa Fe, Federal District, is apparently the same. The mature pods are compressed, curved at base, sparsely pubescent, 5 cm. long; seeds oblong, compressed, shiny, orange-brown, 8×5×3 mm., the hilum central, white, lanceolate, one-fourth as long as the seed.

Bourgeau 581 from Santa Fe (G), and 940 from El Desierto, Valley of Mexico (B), also seem referable here. These two specimens clearly represent the same species, but the leaflets differ from the type of *P. griseus* in being somewhat hastate, that is, having the basal angles more or less produced. Another specimen of *Bourgeau* 940 is *P. pedicellatus* Benth.

3. Phaseolus obvallatus Schlecht. Linnaea **12**: 328. 1838.

This species was collected originally by Ehrenberg at Mineral del Monte, near Pachuca, Hidalgo, Mexico. The type specimen was very kindly lent by the University of Halle. Many specimens will be found in different rbaria under two unpublished names, one by Rose and one by Piper. The plant is perennial from a thick rough-barked woody root, usually fusiform in shape. The corolla is typically scarlet but occasionally violet-purple.

Mexico: Pedregal, *Pringle* 6430* (N). Eslava, *Pringle* 11431 (N). Santa Fe, *Rose & Hay* 5357* (N). Valley of Mexico, *Bourgeau* 734 (G, K); *Rose & Painter* 8633, 6515, 5357 (N). Tucubay, *Bourgeau* 580 (K, N). Chalco, *Kempton & Collins*, August 4, 1921 (N). Popocatapetl, *Rose & Hay* 6258 (N). Toluca, *Rose & Painter* 6789 (N). Ixtaccihuatl, *Pringle* 311 (N). Tultenango, *Rose & Hay* 5439, 7834 (N). Salto de Agua, *Purpus* 1748 (N). Amecameca, *Holway* 5788 (N).

Hidalgo: Metepec, *Pringle* 11968 (N).

Zacatecas: Monte Escobedo, *Rose* 2631 (N).

Oaxaca: Cerro San Felipe, *Conzatti* 4186 (N); *Nelson* 1162 (N). Oaxaca, *Conzatti & Gonzales* 976 (N).

San Luis Potosí: Alvárez, *Palmer* 63 (N).

Durango: Otinapa, *Palmer* 332 (N).

Michoacán: Morelia, *Arsène* 2871, 5234 (N).

Tlaxcala: Contadero, *Pringle* 8606 in part (N).

Costa Rica: Rancho Redondo, *Jiménez* 996 (N). Ochomogo, *Tonduz* 10914 (N).

Specimens marked with an asterisk have the corolla violet-purple instead of scarlet.

4. Phaseolus formosus H. B. K. Nov. Gen. & Sp. **6**: 449. 1823.

Phasolus sylvestris H. B. K. Nov. Gen. & Sp. **6**: 450. 1823.

The types of these two species are in the Jardin des Plantes, Paris. Both are rather scrappy specimens and the technical differences are very slight. They differ from *P. obvallatus* Schlecht. primarily in that the bracteoles are glabrous or but slightly pubescent. The real doubt is not that *P. formosus* and *P. sylvestris* are conspecific but whether *P. obvallatus* is distinct enough to be maintained as a good species. Specimens occur which are essentially intermediate between the two. This species is widespread in Mexico and occurs in Guatemala. There are two specimens in the Jardin des Plantes collected by Hahn (nos. 147 and 501) in the Valley of Mexico, with the information "haricots comestibles" and "grosses tubercules comestibles." The roots are very similar to those of *P. obvallatus*, which are not edible according to information received from the School of Agriculture, Chapingo, Mexico.

The type specimen of *Phaseolus proriferus* Jones (Contr. West. Bot. **12**: 14. 1908) is from Guayanapa Canyon, Sierra Madre, Chihuahua, and is in young fruit. It seems to be *Phaseolus formosus* H. B. K., which occurs in the vicinity.

CHIHUAHUA: Soldier Canyon, *Jones*, September 16, 1903 (N).
DURANGO: Otinapa, *Palmer* 332 (N).
HIDALGO: Trinidad, *Pringle* 13426 (N).
MICHOACÁN: Morelia, *Arsène* 10042, 2871 (N). Cerro Azul, *Arsène* 6577 (N).
ZACATECAS: Los Morones, *Rose* 2724, 2725 (N).
TLAXCALA: Contadero, *Pringle* 8606 in part (N).
PUEBLA: Puebla, *Arsène* 358 (N).
OAXACA: Yalalag, *Nelson* 975 (N). San Juan del Estado, *Smith* 15 (N).
MEXICO: Monte Orizaba, *Rose & Hay* 5694 (N). Popocatapetl, *Rose & Hay* 6319 (N). San Angel, *Rose, Painter & Rose* 9479 (N).
CHIAPAS: San Cristóbal, *Nelson* 3177 (N).
GUATEMALA: Santiago, *Gómez* 1017 (N).

5. Phaseolus leiosepalus Piper, sp. nov.

Herbaceous vine, sparsely leafy; stems slender, terete, striate-sulcate, sparsely strigillose with ascending hairs; stipules ovate, obtuse, glabrous, striate, 4 mm. long; petioles equaling the leaflets; stipels linear, acute; leaflets small, membranous, ovate, obtuse but apiculate, rounded at base, 3-nerved, finely reticulate, sparsely strigillose on both sides, slightly paler beneath, 1.5 to 2.5 cm. long; peduncles hirtellous, much exceeding the leaves; flowers 5 to 10 in a short raceme; bracts broadly lanceolate, acuminate, glabrous, the primary 4 to 6 mm. long, persistent; pedicellar glands small; pedicels glabrous or nearly so, 3 to 5 times as long as the calyx; bracteoles oval, faintly 7-striate, obtuse, as long as the calyx tube, glabrous, purple; calyx glabrous, the very short upper lip entire, the lower lip with 3 broad triangular obtuse teeth much shorter than the tube; corolla red, 12 mm. long.

Type in the U. S. National Herbarium, no. 43734, collected 18 miles northwest of Oaxaca, Oaxaca, Mexico, altitude 2,250 to 2,850 meters, September, 1894, by E. W. Nelson (no. 1358).

6. Phaseolus strigillosus Piper, sp. nov.

Herbaceous vine; stems slender, terete, striate, sparsely strigillose with reflexed hairs; stipules lanceolate, broadest at base, glabrous, striate, 5 mm. long; petioles strigillose with ascending hairs, about as long as the leaflets; stipels linear, acute, glabrous, 2 to 3 mm. long; leaflets membranous, angularly ovate, acuminate and apiculate, rounded or somewhat truncate at base, 4 to 7 cm. long, sparsely strigillose on both sides, scarcely paler beneath; peduncles pubescent like the stem, slender, much exceeding the leaves; racemes short, 10 to 15 flowered; bracts lanceolate, acute, 7-veined, the primary ones 7 mm. long; pedicellar glands obscure; pedicels sparsely pilose, 4 to 5 times as long as the calyx; bracteoles linear-oblong, acute, 7-veined, longer than the calyx; calyx campanulate, glabrous or nearly so, the very short upper lip entire, the lower lip with 3 broad triangular ciliate teeth much shorter than the tube; corolla red, 12 mm. long.

Type in the U. S. National Herbarium, no. 301132, collected near Santa Teresa, Tepic, Mexico, in the Sierra Madre, August 12, 1897, by J. N. Rose (no. 2218).

7. Phaseolus polyanthus Greenm. Field Mus. Bot. **2**: 253. 1907.

The type is from Jalapa, Veracruz, Mexico. The species was long ago collected at Monte Azul, Orizaba, *Bourgeau* 3173 (P).

8. Phaseolus coccineus L. Sp. Pl. 724. 1753.

Phaseolus multiflorus Willd. Sp. Pl. **3**: 1030. 1810.

This species is widely cultivated for food and as an ornamental. The following specimens may be from wild plants:

PUEBLA: Puebla, *Arsène* 320, 1381, 2093 (N).
ZACATECAS: Monte Escobedo, *Rose* 2643 (N).
COAHUILA: Saltillo, *Palmer* 444 (N).

MEXICO: Tacuba, *Rose & Hough* 4553 (N).
JALISCO: San Juan Capistrano, *Rose* 2513 (N).
CHIAPAS: Tumbalá, *Nelson* 3308 (N).
GUATEMALA: Frajanco, Santa Rosa, *Heyde & Lux* 6130 (N).

9. Phaseolus leucanthus Piper, sp. nov.

Annual (?) herbaceous vine; stems stout, terete, sulcate, sparsely strigose with reflexed hairs; stipules triangular, acute, glabrous above, puberulent beneath, 7-nerved, 6 mm. long; petioles much longer than the leaflets; stipels lanceolate, curved, 4 mm. long; leaflets 3, membranous, broadly ovate, abruptly short-acuminate, truncate to rounded at base, sparsely strigillose on both surfaces, scarcely paler beneath, 10 cm. long and nearly as broad; peduncles striate, nearly glabrous, about equaling the leaves; rachis pubescent; raceme dense, many-flowered; bracts narrowly lanceolate, acute, pubescent, 7-nerved, the primary ones 10 mm. long, the lateral ones little smaller; pedicellar glands prominent; pedicels sparsely hirsute, longer than the calyx; bracteoles lanceolate, pubescent, 5-nerved, much longer than the calyx; calyx campanulate, glabrous except ventrally, 5 mm. long, the upper lip short and emarginate, the lower with 3 broadly triangular teeth shorter than the tube; corolla white, 15 mm. long; standard orbicular, emarginate, 12 to 13 mm. long, reflexed from below the middle, thickened at the point of flexure, narrowed at base to a short broad stipe, a short broad auricle on each side at base; wings obovate, involute on the margin, 16 mm. long, the stipe half as long as the blade; keel tubular, the tip spiral in two and one-half close coils; filament of the free stamen much enlarged at base; ovary linear, puberulent; style sparsely bearded just below the lateral stigma; immature pod linear.

Type in the U. S. National Herbarium, no. 773886, collected at San Cristóbal, Veracruz, Mexico, September 3, 1857, by Charles Mohr (no. 123).

10. Phaseolus flavescens Piper, sp. nov.

Twining herb; stems stout, terete, sparsely short-pilose; stipules ovate, acute, 7-nerved, glabrous, 5 to 6 mm. long; petiole longer than the leaflets, sparsely short-pilose; stipels lance-ovate, acute, 4 mm. long; leaflets membranous, ovate-orbicular, rounded to truncate at base, abruptly short-acuminate, sparsely pubescent, strigillose above, short-pilose beneath, strongly reticulate, 7 to 9 cm. long; peduncles stout, reflexed-pilose, exceeding the leaves; racemes many-flowered; bracts lanceolate, broadest above the base, sparsely pubescent, the primary ones 5 to 7 mm. long, persistent, the secondary bracts small; pedicels 1 cm. long; calyx 6 mm. long, campanulate, glabrous except the lowermost lobe, the upper lip short, emarginate, the lower lip with subequal triangular acute lobes shorter than the tube; corolla white, becoming yellow in age, 12 to 15 mm. long; standard orbicular, emarginate, strongly reflexed at about the middle and thickened along the line of flexure, narrowed at base to a short broad stipe, an inflexed auricle at the base of the blade on each side; wings oblong-ovate, the blade truncate at base, produced on the upper angle, twice as long as the slender stipe; keel tubular, the tip with 2 complete close coils; filament of free stamen enlarged just above the base into a heart-shaped swelling; stigma capitate, oblique; style beard dense, short, extending halfway about first turn; mature pods compressed, sparsely strigose, 8 cm. long, 1.5 cm. broad, the stout beak straight, 1 cm. long; seeds oval in outline, much compressed, red, 12×7×3 mm., the hilum nearly central, one-third as long as the seed.

Type in the U. S. National Herbarium, no. 1,143,511, collected at Río San Rafael, below Cerro Tatamá, Caldas, Colombia, altitude 2,400 to 2,600 meters, September, 1922, by F. W. Pennell (no. 10334).

COLOMBIA: Cauca, Coconuco, *Killip* 6842 (N). Cauca, San Antonio, *Pennell* 7646 (N). Tolima, Azufral to Moral, *Killip & Hazen* 9602 (N).

PHASEOLUS ANGUSTISSIMUS, P. FILIFORMIS, AND P. WRIGHTII

These three species seem closely related. The leaflets are more or less lobed; the pods of all are linear, compressed, thin-walled, and tipped with a very slender, straight beak; and the seeds are rugose, a character confined to this group of species.

KEY TO THE SPECIES

Herbage pallid, glaucescent. Leaflet linear to oblong, usually hastately lobed; perennial ..... **1. P. angustissimus.**
Herbage green, not pallid.
Plants annual; pods 2 to 2.5 cm. long ..... **2. P. filiformis.**
Plants perennial; pods 3 cm. long ..... **3. P. wrightii.**

1. Phaseolus angustissimus A. Gray, Pl. Wright. **2**: 33. 1852.

Phaseolus angustissimus latus Jones (Contr. West. Bot. **12**: 14. 1908) is a form with short narrow triangular leaflets, three times as long as broad, the basal angles sometimes produced. *Phaseolus dilatatus* Woot. & Standl. (Contr. U. S. Nat. Herb. **16**: 139. 1913) is merely a form with broad leaflets.

The species occurs in western Texas, New Mexico, and Arizona, but apparently does not range into Mexico.

2. Phaseolus filiformis Benth. Bot. Voy. Sulph. 13. 1844.

This species occurs chiefly in Lower California but is found also on the eastern shores of the Gulf of California. The leaflets are very variable in form.

3. Phaseolus wrightii A. Gray, Pl. Wright. **1**: 43. 1852.

In the original description and especially in a later account of *P. wrightii* (Pl. Wright. **2**: 33), Dr. Gray confused two species, as pointed out by Wooton and Standley (Contr. U. S. Nat. Herb. **16**: 139). The segregated species is *P. grayanus* Woot. & Standl. Typical *P. wrightii* is confined to Texas.

PHASEOLUS METCALFEI AND ITS CLOSE RELATIVES

Phaseolus metcalfei and its relatives include a small group of perennials with deep woody roots, somewhat coriaceous reticulate leaflets, middle-sized flowers, short calyx teeth, red-purple corollas, and broad, much compressed, 3 or 4-seeded pods. The four known species closely resemble one another, and occur from Texas to Arizona and southward into Mexico.

KEY TO THE SPECIES

Bracts orbicular ..... **1. P. venosus.**
Bracts lanceolate.
Calyx glabrous ..... **2. P. ovatifolius.**
Calyx pubescent.
Bracts 0.5 to 1 mm. long; bracteoles one-third as long as the calyx, linear. **3. P. metcalfei.**
Bracts very small; bracteoles minute, lanceolate ..... **4. P. ritensis.**

1. Phaseolus venosus Piper, sp. nov.

Herbaceous vine; stems terete, striate, strigillose with retrorse hairs; stipules lanceolate, broadest at base, acute, striate, puberulent, 3 mm. long; petioles mostly shorter than the leaflets, pubescent with short spreading hairs; stipels linear, not striate; leaflets 3, rhombic-ovate, firm, acute and strongly apiculate, truncate at the very base, 3-nerved, reticulate, minutely and sparsely hirtellous on both surfaces, especially on the veins, 2 to 5 cm. long and nearly as broad; peduncles pubescent with minute spreading hairs, longer than the leaves; racemes

20 to 30 flowered; bracts glabrous, the primary ones orbicular, 2 mm. long, the secondary ones oblong and much smaller; pedicellar glands becoming prominent; pedicels pubescent, about as long as the calyx; bracteoles oblong-ovate, acute, ciliate, one-third as long as the calyx; calyx campanulate, nearly glabrous except ventrally, 4 mm. long, the short upper lip emarginate, the lower lip with 3 broad rounded teeth shorter than the tube; corolla violet; standard orbicular, emarginate, reflexed above, thickened basally, 10 mm. long, the auricles inflexed, the stipe short and broad; wings 15 mm. long, broadly obovate, inrolled at the margins, angled at base, stipitate, the auricle inflexed; keel when coiled shorter than the wings, stipitate, without auricles, the beak in 2 complete close coils; vexillar stamen free, thickened and geniculate at base; stigma terminal, oblique.

Type in the U. S. National Herbarium, no. 301614, collected near Colotlán, Jalisco, Mexico, on the road to Plateado, August 31, 1897, by J. N. Rose (no. 2688).

ZACATECAS: Near Monte Escobedo, *Rose* 2648 (N). Near Plateado, *Rose* 2802 (N).

JALISCO: Guadalajara, *Rose & Painter* 7430 (N).

2. Phaseolus ovatifolius Piper, sp. nov.

Herbaceous vine; stems sparsely strigillose with retrorse hairs; stipules triangular, acute, glabrous, 5-nerved, 2.5 mm. long; petioles about as long as the leaflets; stipels linear, minute; leaflets firm, rhombic-ovate, obtuse and apiculate, truncate at base, reticulate, green on both sides, glabrous except for a few appressed hairs on the veins beneath, 3 cm. long, nearly as broad; peduncles about 4 times as long as the leaves; racemes dense in anthesis, about 20-flowered; primary bracts lanceolate, acute, striate, glabrous, persisting, 3 mm. long, the secondary ones similar but smaller; pedicellar glands small; pedicels twice as long as the calyx; bracteoles linear, minute, much shorter than the calyx; calyx campanulate, glabrous except ventrally, 2.5 mm. long, the short upper lip emarginate, the lower lip with 3 broadly triangular, obtuse teeth shorter than the tube; corolla violet; standard orbicular, emarginate, reflexed, thickened below, 10 mm. long, the auricles inflexed, the stipe short and thick; wings spatulate-oblong, angled at base, stipitate, the auricle incurved, 15 mm. long; keel stipitate, the beak with 2 close coils.

Type in the U. S. National Herbarium, no. 300967, collected in the Sierra Madre between Santa Gertrudis and Santa Teresa, Tepic, Mexico, August 8, 1897, by J. N. Rose (no. 2067).

Closely related to *P. metcalfei* Woot. & Standl. but easily distinguishable by the smaller flowers, smaller leaflets, and different pubescence.

3. Phaseolus metcalfei Woot. & Standl. Contr. U. S. Nat. Herb. **16**: 140. 1913.
Phaseolus retusus Benth. Pl. Hartw. **11**: 1839. Not *P. retusus* Moench, 1794.
Phaseolus maculatus Scheele, Linnaea **2**: 465. 1848. Not *P. maculatus* Mart. 1829.

This species ranges from Texas to Arizona and Mexico. It is known from the Mexican States of Sonora, Chihuahua, San Luis Potosí, Aguascalientes, Hidalgo, Zacatecas, Puebla, and Oaxaca.

4. Phaseolus ritensis Jones, Contr. West. Bot. **12**: 14. 1908.

This hardly distinct species replaces *P. metcalfei* Woot. & Standl. in Arizona. It has been collected also in Mexico near Santa Teresa, Tepic, in the Sierra Madre, *Rose* 2153.

PHASEOLUS PEDICELLATUS AND ITS ALLIES

The species of this large group are in some cases very closely allied. It may well develop that with the accumulation of further material some of them will have to be reduced.

KEY TO THE SPECIES

Leaflets distinctly lobed, at least the basal angle produced.
Bracts foliaceous, more than 5 mm. long.
Leaflets deeply lobed; bracts 5 to 8 mm. long---------- **1. P. foliaceus.**
Leaflets faintly lobed; bracts 5 mm. long---------- **2. P. floribundus.**
Bracts not foliaceous, about 2 mm. long.
Nerves of the bracteoles prominent, 3 to 5. Bracteoles elliptic to obovate, nearly half as long as the calyx, strongly 3-ribbed; leaflets 3-lobed. **3. P. schaffneri.**
Nerves of the bracteole one or none.
Bracts 3-lobed toward tip, the middle lobe awnlike--- **4. P. oaxacanus.**
Bracts entire.
Bracteoles ovate.
Leaflets faintly 3-lobed---------- **5. P. pedicellatus.**
Leaflets deeply lobed---------- **6. P. polymorphus.**
Bracteoles linear to oblong---------- **7. P. palmeri.**
Leaflets deeply 3-lobed.
Bracteoles 1-nerved; calyx pruinose-puberulent- **8. P. scabrellus.**
Bracteoles nerveless; calyx short-pubescent---- **9. P. grayanus.**
Leaflets faintly 3-lobed. Calyx puberulent---- **10. P. esperanzae.**
Leaflets usually entire, the basal angles rarely produced.
Leaflets lanceolate, broadest at base, densely pubescent beneath. **11. P. salicifolius.**
Leaflets ovate or, if narrow, not pubescent beneath.
Pedicels 3 to 4 times as long as the calyx.
Bracteoles minute, nerveless---------- **12. P. laxiflorus.**
Bracteoles half as long as calyx, striate---------- **13. P. viridis.**
Pedicels at most twice as long as the calyx.
Pods 10 to 12 times as long as broad. Annual---- **14. P. acutifolius.**
Pods 4 to 5 times as long as broad.
Leaflets acute.
Pods puberulent; leaflets puberulent---------- **15. P. mollis.**
Pods glabrous; leaflets glabrous or nearly so---- **16. P. falciformis.**
Leaflets acuminate.
Standard puberulent outside---------- **17. P. lunatus.**
Standard glabrous.
Bracts 3-lobed, the middle lobe much elongate and awnlike. **4. P. oaxacanus.**
Bracts entire.
Herbage glabrous---------- **18. P. rosei.**
Herbage puberulent---------- **19. P. bolivianus.**

1. Phaseolus foliaceus Piper, sp. nov.

Herbaceous vine; stems slender, terete, sparsely puberulous with reflexed hairs; stipules triangular-lanceolate, 3-nerved, glabrous, 4 mm. long; petioles puberulous, as long as the leaflets; stipels subulate, minute; leaflets 3, membranous, deeply lobed, the median 3-lobed, the lateral 2-lobed, the lobes oblong-ovate, acute, the median longest, sparsely pustulate-strigillose above, puberulous along the veins beneath, 3 to 4 cm. long; peduncles slender, 15 cm. long; bracts green, lanceolate, attenuate-acute, usually with a lateral lobe, 7-veined, scaberulous beneath, glabrous above, 7 mm. long; pedicels puberulent with spreading hairs, twice as long as the calyx; bracteoles linear-lanceolate, acute, nerveless, glabrous, nearly one-third as long as the calyx; calyx campanulate, 3 to 3.5 mm. long, ciliate, bearded ventrally, the upper lip short and emarginate, the lower lip 3-lobed, the lateral lobes rounded, the median acute and half as

long as the tube; corolla 10 mm. long; standard orbicular, the upper two-thirds reflexed, thickened at the place of flexure; wings oblong, the blades truncate at base and produced on the upper basal angle, the slender stipe half as long as the blade; keel tubular, with 2 complete close coils, the blades truncate at base and stipitate; free stamen with a globose enlargement above the base; anthers small, yellow; style beard sparse, extending halfway around the first coil; stigma lateral; ovary linear, pubescent, 5-ovuled; old pod valves falcate, compressed, short-beaked, sparsely pubescent, 7 cm. long, 1 cm. broad.

Type in the U. S. National Herbarium, no. 333018, collected near La Providencia, Sierra Madre, and Sierra Santa Bárbara, Mexico, altitude 1,950 to 2,400 meters, September 11–12, 1898, by E. W. Nelson (no. 4990).

2. Phaseolus floribundus Piper, sp. nov.

Herbaceous vine; stems slender, terete, glabrous or with a few scattered small hairs; stipules ovate, obtuse, 7-nerved, 5 mm. long; petioles sparsely hirtellous, about as long as the leaflets; stipules linear, 1 to 3 nerved, 2 mm. long; petiolules 2 to 3 mm. long, pubescent; leaflets membranous, ovate, obtuse and apiculate, truncate to broadly cuneate at base, more or less 3-lobed, the basal angles rounded and produced, usually much shorter than the triangular middle lobe, very sparsely puberulent on both faces, scarcely paler beneath, 2 to 4 cm. long; peduncles slender, longer than the leaves; raceme loosely many-flowered, the rachis puberulent; bracts lanceolate, persistent, 5 to 7 nerved, the principal ones 5 mm. long; pedicels slender, twice as long as the calyx; bracteoles oblong, 1-nerved, one-third as long as calyx; calyx 5 mm. long, the tube campanulate, somewhat pubescent, especially on the lower side, the upper lip short and entire, the lower lip with 3 broadly ovate, obtuse teeth less than half as long as the tube, the median tooth longer and larger than the lateral; standard orbicular, 10 mm. long, strongly reflexed and somewhat thickened at about the middle, a small inflexed auricle on each side of the short broad stipe; wings 12 mm. long, the blade obovate, with a semicircular projection on the upper side at base, the slender stipe 5 mm. long; keel narrow, its tip with 2 complete close coils; filament of free stamen with a circular enlargement just above the base; style beard short and sparse; stigma lateral; ovary linear, pubescent; pods (immature) linear, densely and loosely pubescent, the beak short and recurved.

Type in the U. S. National Herbarium, no. 397669, collected at Alvárez, San Luis Potosí, Mexico, September 5 to 10, 1902, by Edward Palmer (no. 121). A duplicate of this collection is in the herbarium of the Field Museum of Natural History.

3. Phaseolus schaffneri Piper, sp. nov.

Herbaceous vine, glabrous to the inflorescence; stems slender, terete; stipules lance-ovate, acute, glabrous, 3 to 5 nerved, 2 to 3 mm. long; petioles about as long as the leaflets; stipels lanceolate, 1-nerved; leaflets 3, membranous, 2 to 3 cm. long, basally 3-lobed, the central lobe oblong-lanceolate, obtuse and apiculate, longer than the broader oblong lateral lobes, glabrous except the scabrous margin, scarcely paler beneath; peduncles twice as long as the leaves; flowers few in racemes; bracts lanceolate, small, about one-fourth as long as the pedicels; pedicels appressed-puberulent, 2 to 3 times as long as the calyx; bracteoles oblong, obtuse, slightly broader above, 3-nerved, half as long as the calyx; calyx campanulate, 3 mm. long, glabrous except the ciliate margin, the broad upper lip emarginate, the lower lip with 3 broad triangular acute teeth, nearly half as long as the tube; corolla 8 to 10 mm. long; keel in 2 complete close coils; pod falcate, compressed, glabrous, 4 cm. long, 1 cm. broad, the beak short and straight.

Type in the U. S. National Herbarium, no. 939707, collected at San Luis Potosí, Mexico, in 1879 by J. G. Schaffner (no. 606). In the herbarium of the New York Botanical Garden is a duplicate and also *Schaffner* 605, collected at the same place.

The description is based on all three specimens. The species is distinguished at once from any closely related one by the large 3-nerved bracteoles.

4. Phaseolus oaxacanus Rose, Contr. U. S. Nat. Herb. **8**: 48. 1903.

This species is sharply marked by the peculiar 3-lobed bracts. Besides the type, collected by Pringle on the Sierra de San Felipe, Oaxaca, it has been found at the same place also by Nelson (no. 1181) and at La Parada, Oaxaca (*Nelson* 996).

5. Phaseolus pedicellatus Benth. Ann. Wien. Mus. Naturg. **2**: 137. 1840.

The type of this is in the Herbarium of the Botanisches Museum in Munich, and I am indebted to Dr. Hermann Ross for a photograph and fragment of it. It was collected somewhere in Mexico by Karwinski. The plant is perennial, with a deep fusiform root, as shown by Bourgeau specimens.

COAHUILA: Monclova, *Palmer* 2122 (N, G, K).

MORELOS: Cuernavaca, *Pringle* 9769 (N, K).

MEXICO: Sierra de Ajusco, *Pringle* 6616 (N, K). Santa Fe, *Bourgeau* 581 (G). Desierto, *Bourgeau* 940 (N, B, P). San Nicolás, *Bourgeau* 940 (K).

6. Phaseolus polymorphus S. Wats. Proc. Amer. Acad. **17**: 346. 1822.

Phaseolus purpusi T. S. Brandeg. Univ. Calif. Publ. Bot. **4**: 271. 1912.

This species is known only by the original specimens, from San Luis Potosí, *Parry & Palmer* 188, the type of *P. polymorphus;* and Minas de San Rafael, San Luis Potosí, *Purpus* 5196, the type of *P. purpusi.*

7. Phaseolus palmeri Piper, sp. nov.

Herbaceous vine; stems slender, terete, purple, sparsely puberulent; stipules ovate, obtuse, strongly 5-nerved, glabrous, 2 mm. long; petioles slender, shorter than the leaves; stipels oblong, acute, 1-nerved, 1 mm. long; leaflets membranous, deeply 3-lobed, squarely truncate at base, 2 to 2.5 cm. broad, minutely puberulent above, nearly glabrous and not paler beneath, the median lobe oblong-ovate, the lateral lobes triangular-ovate, each sometimes obscurely 2-lobed, all obtuse and apiculate; peduncles puberulent, mostly exceeding the leaves; racemes 4 to 12 flowered; principal bracts broadly ovate, 3 to 5 nerved, 1.5 mm. long; pedicels longer than the calyx; bracteoles ovate, acute, 1-nerved, one-fifth as long as calyx; calyx campanulate, minutely puberulent, 3 mm. long, the short upper lip shallowly emarginate, the lower lip with 3 broad acutish teeth one-third as long as the tube; corolla violet; standard orbicular, shallowly emarginate at apex, short-stipitate, 1 cm. broad, cuneate at base, without auricles, reflexed from below the middle, thickened along the zone of flexure, at each end of which is a double fold; wings 15 mm. long, the blade broadly obovate, truncate at base, inrolled at margin, the slender stipe 4 mm. long; keel cylindrical, 2-lobed at orifice, the tip with one and one-half close coils; ovary linear, appressed-puberulent; pods slightly falcate, much compressed, short-beaked, nearly glabrous, 3 cm. long, 1 cm. broad, 3 or 4-seeded.

Type in the U. S. National Herbarium no. 471163, collected near Concepción del Oro, Zacatecas, Mexico, August 11 to 14, 1904, by Edward Palmer (no. 294).

8. Phaseolus scabrellus Benth.; S. Wats. Proc. Amer. Acad. **17**: 346. 1881–2.

In the original description Watson cites two specimens as follows: "In the Caracol Mountains, Coahuila (2122); also collected by Coulter in Sonora Alta." The first specimen is *Palmer* 2122, which really is *P. pedicellatus* Benth. The second is the one on which Bentham had written his name *Phaseolus scabrellus,* and it is therefore accepted as the type of this species.

SONORA: Sonora Alta, *Coulter* (G, K). Papago Tanks, *MacDougal* 48 (N).

HIDALGO: Ixmiquilpan, *Purpus* 1365 (Y, G, F).

QUERÉTARO: Cadereyta, *Rose & Painter* 9723 (Y, N). Cadereyta to Vizarrón, *Altamirano* 1660 (N).

San Luis Potosí: Alvárez, *Palmer* 121 (N; this same number in the Field Museum is *P. esperanzae* Seaton).

9. Phaseolus grayanus Woot. & Standl. Contr. U. S. Nat. Herb. **16:** 139. 1913.

This species is common in New Mexico and Arizona. In Mexico it is known from Colonia García, Chihuahua, *Townsend & Barber* 80.

10. Phaseolus esperanzae Seaton, Proc. Amer. Acad. **28:** 118. 1893.

Puebla: Esperanza, *Seaton* 371 (type, G); *Purpus* 3639 (G, N). Cortadero, *Pringle* 9623 (N):

San Luis Potosí: Alvárez, *Palmer* 121 (N, T; Palmer's 121 consisted of both *P. esperanzae* and *P. floribundus*. The specimen in the Field Museum herbarium is the latter).

11. Phaseolus salicifolius Piper, sp. nov.

Herbaceous vine, pubescent throughout; stems terete, slender, pilose with yellow hairs; leaves rather widely scattered; stipules triangular, broadest at base, acute, pubescent, striate, 3 mm. long; petioles densely pubescent, much shorter than the leaflets; stipels minute, ovate, striate, glabrous; leaflets 3, triangular-lanceolate, broadest at the truncate base, obtusish and apiculate, 1-nerved, hispidulous above, paler and densely pubescent beneath, 3 to 5 cm. long; peduncles exceeding the leaves; racemes rather closely 8 to 15 flowered; bracts lanceolate, pubescent, promptly deciduous, about 2 mm. long; pedicels pubescent, as long as the calyx; bracteoles lanceolate, pubescent, longer than the calyx; calyx campanulate, loosely pubescent, 3 mm. long, the very short upper lip emarginate, the lower lip with 3 broadly triangular teeth much shorter than the tube; corolla reddish; standard reflexed, 10 mm. long; wings oblong, 14 mm. long; keel with 2 close coils.

Type in the U. S. National Herbarium, no. 1,083,789, collected in the Sierra de Chabarría, Sinaloa, Mexico, in 1921 by Jesús G. Ortega (no. 4065).

Owing to the scantiness of the material, a flower was not dissected.

12. Phaseolus laxiflorus Piper, sp. nov.

Herbaceous vine; stems slender, terete, retrorsely strigillose; leaves rather sparse; stipules lanceolate, broadest at base, obtuse, glabrous above, puberulent beneath, striate, 5 mm. long; petioles glabrous, longer than the leaflets; stipels linear-oblong, glabrous, 2.5 mm. long; leaflest 3, thin, angularly ovate, attenuate-acuminate, apiculate rounded or truncate at base, sparsely strigillose above, glabrous beneath, 4 to 5 cm. long; peduncles much exceeding the leaves; inflorescence a loose panicle, about 25-flowered; bracts linear-oblong, acutish, striate, glabrous, deciduous, the primary ones 4 mm. long, the secondary much smaller; pedicellar glands small; pedicels slender, 4 to 5 times as long as the calyx; bracteoles minute, oblong, about one-fifth as long as the calyx; calyx campanulate, puberulent or ventrally pubescent, ciliate, the short upper lip emarginate, the lower lip with 3 subequal, broadly triangular teeth much shorter than the tube; corolla violet; standard 10 mm. long, orbicular, emarginate, sharply reflexed, the upper margins inrolled, the lower central part thickened, concave, yellow, the auricles sharply inflexed, the stipe short and broad; wings obliquely oblong-spatulate, 14 mm. long, inrolled at the margins, angled at base, stipitate; keel 10 mm. long when coiled, with two and a half close turns to the spiral, stipitate, not auricled; vexillar stamens free, the filament enlarged just above the base into a circular yellow organ.

Type in the U. S. National Herbarium, no. 462384, collected at the Trinidad Iron Works, Hidalgo, Mexico, August 21, 1905, by C. G. Pringle (no. 13690).

Allied to *P. esperanzae* Seaton but easily distinguished by the very long pedicels and by the leaflets. In both species the pedicellar glands are minute or wanting.

13. Phaseolus viridis Piper, sp. nov.

Herbaceous vine, glabrous throughout except a minute ciliation of the youngest leaflets; stems slender, terete; stipules firm, irregularly triangular-oblong, 4-nerved, 2 mm. long; petioles shorter than the leaflets; stipels linear, curved, 1.5 mm. long; leaflets 3, membranous, ovate, acuminate, with a blunt apiculate tip, cuneate to rounded at base, not paler beneath, 6 to 10 cm. long; peduncles mostly exceeding the leaves; racemes 10 to 20 flowered; primary bracts oblong-ovate, acute, firm, 7-nerved, 2 mm. long, the secondary ones narrower and much smaller; pedicels slender, 5 to 10 mm. long, 2 to 4 times as long as the calyx; bracteoles oblong, strongly 3-nerved, about half as long as the calyx; calyx campanulate, 2 mm. long, the short upper lip emarginate, the lower lip with 3 broad triangular subequal teeth about half as long as the tube; corolla glabrous, purplish, 12 mm. long; standard 8 mm. long, orbicular, strongly concave, reflexed above, transversely thickened at the line of flexure, the basal portion compressed and trough-shaped, short-stipitate, a small inflexed auricle at base of blade on each side; wings exceeding the standard, narrowly obovate, involute at the margins, a small rounded process at base, the slender stipe half as long as the blade; keel tubular, the tip in 2 complete close coils; anthers yellow, small, 5 mm. long; style beard short-haired, extending nearly halfway around the first turn; stigma lateral; pods (immature) falcate, much compressed, the beak short and straight, 5-seeded, 2.5 cm. long.

Type in the U. S. National Herbarium, no. 576636, collected at Cubilquitz, Guatemala, February, 1904, by H. von Tuerckheim (no. II.897; *J. D. Smith* no. 8510).

Other specimens examined:

MEXICO: Zacuapan, Veracruz, *Purpus* 8002 (N, Y, Mo.).

Closely related to *P. lunatus* L.

14. Phaseolus acutifolius A. Gray, Pl. Wright. **1**: 43. 1852.

Phaseolus acutifolius tenuifolius A. Gray, Pl. Wright. **2**: 33. 1853.

Phaseolus tenuifolius Woot. & Standl. Contr. U. S. Nat. Herb. **16**: 140. 1913.

Phaseolus latifolius Freeman, Bot. Gaz. **56**: 412. 1913.

In its wild form this species ranges from Western Texas to Arizona and southward in Mexico to Guadalajara, Jalisco. The leaflets range in form from narrowly linear to broadly ovate. In the cultivated varieties (the tepary bean) the leaflets are broad and the seeds variously colored—white, yellow, brown, violet, or black—and variously mottled.

15. Phaseolus mollis Hook. Trans. Linn. Soc. Bot. **20**: 228. 1847.

This species, apparently confined to the Galápagos Islands, was first collected on James Island by Charles Darwin. It has recently been found on Albemarle Island, *Stewart* 1603, 1604. Baur's 86, a mere scrap from Jarvis Island, referred by Robinson (Proc. Amer. Acad. **38**: 153. 1902) to *P. mollis*, is *P. vestitus* Hook.

16. Phaseolus falciformis Piper, sp. nov.

Herbaceous vine; stems slender, terete, hirtellous with many short hairs and hirsute with few yellow hairs; stipules ovate-triangular, acute, 3-nerved, puberulent, 3 mm. long; petioles shorter than the leaflets; leaflets 3, firm-membranaceous, oblong to ovate, obtuse and apiculate, rounded at base, sparsely appressed-pubescent on both sides, 2 to 5 cm. long; stipels oblong, 1-nerved; peduncles exceeding the leaves, 5 to 10 cm. long, pubescent like the stems; bracts persistent, lanceolate, acute, pubescent beneath, 3-nerved, the principal ones 3 mm. long; pedicels shorter than the calyx; bracteoles lance-linear, pubescent, 1-nerved, one-third as long as the calyx; calyx campanulate, 2.5 mm. long, pubescent, especially on the ventral part, the upper lip emarginate, the lower with subequal triangular acute lobes about as long as the tube; corolla purple (?), glabrous, 7 mm. long; keel tubular, the tip in 2 complete close coils; pods falcate, compressed, short-beaked, finely puberulent, 3 cm. long; seeds 3 to 5.

Type in the U. S. National Herbarium no. 763711, collected near Compostela, Tepic, Mexico, altitude 1,500 to 1,800 meters, April 7–8, 1897, by E. W. Nelson (no. 4173).

Closely related to *P. lunatus* L., but distinguished by the pubescence, the form of the leaflets, the glabrous corolla, and the small puberulent pods.

17. Phaseolus lunatus L. Sp. Pl. 724. 1753.

This is a very diverse aggregation of both wild and cultivated forms whose status is variously interpreted by different botanists. In the writer's judgment it is but a single botanical species. The leaflets vary from narrowly lanceolate or nearly linear to broadly rhombic-ovate. The pods display wide variation in size and shape, while the seeds are very diverse in color and size. Wild forms occur in Cuba, Porto Rico, and Guadeloupe, from Mexico to Panama, and in Colombia, Venezuela, Brazil, and Peru, and doubtfully in Argentina.

Phaseolus lunatus is the Lima bean of cultivation. There is an endless number of cultivated forms, varying in shape and color of seeds. In some forms the plants are bushy and erect, in others long and scandent. The various varieties are cultivated widely in most temperate regions and also in the Tropics.

18. Phaseolus rosei Piper, n. sp.

Herbaceous vine, glabrous except for puberulence fugitive on the young stems and leaves but persistent in the inflorescence; stem slender, terete; stipules lanceolate, acute, 3-nerved, 2 mm. long; petioles slender, shorter than the leaflets; stipels oblanceolate, 1-nerved; leaflets 3, thin-membranaceous, ovate, acuminate with the tip blunt and apiculate, rounded to truncate at base, 4 to 6 cm. long, the lateral ones oblique; peduncles shorter than the leaves; racemes few (3 to 8) flowered; bracts lance-linear, acute, puberulent, 1-nerved, small; pedicels puberulent, several times as long as calyx; bracteoles oblong, puberulent, 3-nerved, one-third as long as calyx: calyx campanulate, 2.5 mm. long, puberulent, the upper lip very short and emarginate, the lateral teeth broadly ovate, short, the median tooth triangular and a little longer but only one-fourth as long as the tube; corolla 8 mm. long; standard violet, orbicular, emarginate at apex, tapering to a broad wedge-shaped base, short-stipitate, reflexed from below the middle, a transverse thickening at place of flexure, the auricles marginal, inflexed, forming sac-like pouches; wings cream-color, cuneate-obovate, the margins inrolled, angled at base, the stipe 3 mm. the blade 7 mm. long; keel cream-color, cylindric, the tip coiled in 2 close turns; filament of the free stamen with a globose enlargement above the base; style filiform, with a short sparse beard on the ventral side below the stigma; stigma lateral, the tip of the style terete; ovary linear, appressed-pubescent; pods falcate, compressed, glabrous, straw-color, 1 cm. broad, 4 cm. long including the slender straight (5 mm. long) beak, 2-seeded; seeds black, shiny, much compressed, obscurely marked with radiate ridges, 10×7×2 mm., the concave white hilum nearly half as long as the seed.

Type in the U. S. National Herbarium no. 1,241,201, the specimen grown in the greenhouse at Washington, D. C., from seeds collected on a dead vine twining over shrubs at Huigra, Ecuador, by J. N. Rose (no. 24067).

This species is probably annual, as indicated by the field note. The roots are fibrous, but the plants have lived two years in the greenhouse.

19. Phaseolus bolivianus Piper, sp. nov.

Vine, apparently perennial, woody at base; stems terete, densely puberulent with rusty reflexed hairs; stipules triangular, acute, pubescent beneath, 7 mm. long; petioles puberulent, not as long as the leaflets; stipels linear, pubescent; leaflets ovate, the lateral oblique, rounded at base, acuminate, thinly puberulent above, densely so and paler beneath, 6 to 10 cm. long; peduncles puberulent, not as long as the leaves; racemes interrupted, 10 to 12 flowered; principal bracts lanceolate, pubescent, acute, 4 to 6 mm. long, persistent; pedicels pubescent,

nearly twice as long as the calyx; bracteoles lance-linear, pubescent, two-thirds as long as the calyx; calyx broadly campanulate, 3.5 mm. long, rusty-pubescent, the upper lip short, emarginate, the lower with 3 broad triangular acute teeth half as long as the tube; corolla 1 cm. long, puberulent on the back of the standard; standard violet, orbicular, emarginate, 1 cm. broad, reflexed from below the middle and thickened transversely at the flexure, puberulent below the thickening, the stipe short and broad and the marginal auricles inflexed; wings pale, narrowly obovate, inrolled at the margins, angled at base, the stipe slender, 5 mm. long, the blade 10 mm. long; keel cylindrical, white, the tip in 2 close coils; anthers oblong, white; stigma linear, oblique, lateral; style short-bearded ventrally for about twice the length of the stigma; ovary lanceolate, densely rusty-strigose; pods falcate, much compressed, short-beaked, finely puberulent, 6 cm. ong, 1.5 cm. broad; seeds oval, much compressed, 8×6×2 mm., brown, minutely speckled, somewhat shiny; hilum central, white, ovate, one-fifth as long as the seed.

Type in the U. S. National Herbarium, no. 1,058,964, collected at Cochabamba, Bolivia, March 14, 1920, by E. W. D. and Mary M. Holway (no. 411).

BOLIVIA: Sorata, *Mandon* 746 (L, G).

PERU: Ollantaytambo, *Cook & Gilbert* 511 (N). Chachapaya, *Mathews* (L).

PHASEOLUS MICRANTHUS, P. BREVICALYX, AND P. OPACUS

These three species are very similar in having the flowers small and the calyces black-bristly.

KEY TO THE SPECIES

Stems both bristly and puberulent; young pods densely puberulent; calyx densely bristly, 3 mm. long. Bracts longer than the pedicels.
1. P. micranthus.

Stems bristly, not puberulent; young pods glabrous; calyx sparsely bristly.
Calyx 2 mm. long; bracts shorter than the pedicels; racemes few-flowered.
2. P. brevicalyx.

Calyx 2.5 mm. long; bracts longer than the pedicels; racemes many-flowered.
3. P. opacus.

1. Phaseolus micranthus Hook. & Arn. Bot. Beechey Voy. 287. 1836-9.

This, originally collected by Lay and Collie in Jalisco, is matched by *Palmer* 17 from Tepic. *P. micranthus* Mart. & Gal. is a form of *P. heterophyllus* H. B. K. with linear leaflets.

2. Phaseolus brevicalyx Micheli, Mém. Soc. Phys. Hist. Nat. Genève **34**: 261. 1902–5.

This is known only by the type specimen, collected in the Sierra Madre, Mexico. There is a specimen in the Gray Herbarium.

3. Phaseolus opacus Piper, sp. nov.

Herbaceous vine; stems slender, pilose with yellow hairs; stipules triangular-lanceolate, acute, sparsely hairy beneath, 7 to 9 nerved, 3 to 4 mm. long; petioles pilose, about as long as the leaflets; stipels linear; leaflets 3, membranous, lance-ovate, obtuse and apiculate, rounded at base, sparsely pilose on both surfaces, paler beneath, 2 to 6 cm. long; peduncles pilose, exceeding the leaves; racemes 10 to 12 flowered; bracts lanceolate, acute, ciliate, 3-nerved, persistent, the principal ones 3 mm. long, projecting beyond the buds at the tip; pedicels as long as the calyx; calyx campanulate, sparsely hirsute, especially on the lower lip, 3 mm. long, the upper lip emarginate, the lower with 3 subequal acute teeth over half as long as the tube; corolla violet, 8 to 9 mm. long; standard orbicular, emarginate, reflexed, thickened at the point of flexure, stipitate, not auricled; wings oblong, obtuse, short-stipitate; keel with 2 complete close coils; ovary pubescent; style beard short, extending halfway around first coil; stigma oblique; pods reflexed, linear, falcate, compressed, 6-seeded, glabrous, 2 cm. long.

Type in the U. S. National Herbarium, no. 567441, collected at Barranca de Tenampa, Zacuapan, Veracruz, Mexico, March, 1914, by C. A. Purpus (no. 7081).

MISCELLANEOUS SPECIES, SECTION EUPHASEOLUS

Phaseolus tenellus Piper, sp. nov.

Herbaceous vine, apparently perennial, glabrous throughout; stems terete, very slender; stipules oblong-ovate, acute, striately 5-nerved, 6 mm. long; petioles longer than the leaflets; stipels linear; leaflets 3, rhombic-ovate, sometimes obscurely lobed on the angles, rather firm, acutish and short-apiculate, broadly cuneate at base, paler beneath, 3-nerved, finely reticulate, minutely scabrous on the nerves and margins, 15 to 25 mm. long; peduncles about as long as the leaves; racemes with few (usually 2 or 3) flowers; primary bracts oblong, acute, only the midnerve prominent, 3 mm. long, the secondary ones linear, minute; pedicels longer than the calyx; bracteoles exceedingly minute or sometimes apparently wanting; calyx campanulate, very oblique, 5 mm. long, the upper lip short, emarginate, the lower shorter than the tube, with 3 broad flat rounded teeth; corolla violet; standard 15 mm. long, broadly oblong, notched at apex, somewhat reflexed, angled at base but not auricled, the stipe very broad, 3 mm. long; callosities none, but 2 triangular appendages on the inside near the base, pointing toward the tip; wings spatulate, as long as the standard, angled at base but not auricled, the stipe 4 mm. long; keel coiled at tip with one and one-half close turns, about two-thirds as long as the wings; vexillar stamen free, the base of the filament much thickened but not geniculate, the others united for two-thirds their length; anthers oblong; ovary linear, scaberulous, with about 10 ovules; style glabrous to the coils, then long-hairy nearly to the stigma; stigma terminal, oblong, slightly inflexed.

Type in the U. S. National Herbarium, no. 1,003,657, collected at Campanario, near Morelia, Michoacán, Mexico, altitude 2,200 meters, September 12, 1912, by Bro. G. Arsène (no. 8310). Also collected at the same place September 14, 1911 (*Arsène* 6782).

Phaseolus intonsus Piper, sp. nov.

Herbaceous vine; stems slender, terete, hirsute with yellow hairs; stipules oblong-ovate, acutish, pubescent beneath, 1 to 7 nerved, 6 mm. long; petioles pubescent like the stems, shorter than the leaflets; stipels lanceolate, broadest in the middle, acute, 3-nerved, pubescent beneath, 3 mm. long; leaflets membranaceous, ovate, entire or obscurely 3-lobed at base, acutish, slightly paler beneath, pustulate-hirsute on both surfaces, 3 to 3.5 cm. long; peduncles longer than the leaves; racemes dense, about 12-flowered; bracts lanceolate, acute, pubescent beneath, 5-nerved, 5 to 6 mm. long; pedicels shorter than the calyx; bracteoles linear, pubescent, 1-nerved, one-third as long as the calyx; calyx campanulate, hirsute, 2.5 to 3 mm. long, the short upper lip slightly notched, the lower lip with triangular acute subequal lobes not half as long as the tube; corolla 8 mm. long; standard stipitate, orbicular, somewhat curled, sharply reflexed from below the middle, apparently without auricles or appendages; wings stipitate, the blade oblong, with an oblong appendage on the upper side near the base; free stamen with a transverse enlargement near the base, not geniculate; keel tubular, the tip coiled in 2 close turns; style sparsely bearded; stigma oblique; ovary villous, short, linear.

Type in the herbarium of the Muséum d'Histoire Naturelle, Paris, collected in the Sierra de Guanajuato, Mexico, altitude 2,000 meters, in 1872, by M. E. Guillemin-Tarayre.

The relationships of this species are uncertain; it is perhaps near *P. pilosus* H. B. K.

Phaseolus sempervirens Piper, sp. nov.

Perennial vine; stems somewhat woody, 40 cm. high, slender, terete, puberulous; petioles slender, as long as the leaflets; stipules triangular, acute, 2mm. long; stipels subulate; leaflets coriaceous, lanceolate to lance-ovate, obtuse, rounded at base, the margin revolute, strongly reticulate, paler beneath, finely hirtellous when young; peduncles puberulous, 6 to 10 cm. long; raceme rather closely 8 to 12 flowered; primary bracts triangular, 3-nerved, 2 mm. long; pedicels 2 to 3 mm. long; bracteoles linear, minute, about one-fifth as long as the calyx; calyx campanulate, puberulous, 2.5 mm. long, the emarginate upper lip very short, the lower lip with 3 broadly triangular acute teeth about half as long as the tube; corolla 10 mm. long, apparently purple or violet; standard orbicular, short-stipitate, reflexed from below the middle, bearing a callosity near the place of bending, a flaplike appendage on each side near the base back from the margin; wings oblong, truncate at base, not auricled, the blade 7 mm. and the stipe 3 mm. long; keel tubular, not broadened in the middle, twisted at tip into nearly 2 close coils; free stamen enlarged near the base of the filament into a circular expansion, not geniculate; stigma lateral, the style short-bearded both above and below for a short distance; immature pod linear, glabrous, much compressed, short-beaked, 5-ovuled.

Type in the herbarium of the British Museum of Natural History, collected in the Sierra Madre, Mexico, by Seemann.

Phaseolus jaliscanus Piper, sp. nov.

Slender vine; stems terete, sparsely puberulent when young; petioles puberulent, much shorter than the leaflets, about 1 cm. long; stipules lanceolate, acute, 3-nerved, 3 mm. long; stipels linear, 2 mm. long; leaflets coriaceous, oblong to oblong-lanceolate, obtuse, apiculate, rounded at base, similarly green on both sides but with a pale band along the central rib above, finely and sparsely puberulent, 3 to 4 cm. long; peduncles 6 to 8 cm. long; racemes 6 to 8 flowered; primary bracts lanceolate, puberulent, 2 mm. long; pedicels as long as the calyx; bracteoles minute, linear, ciliate, one-fourth as long as the calyx; flowers violet; calyx campanulate, glabrous except the lowest lobe, 3 mm. long, the short upper lip emarginate, the lower lip with 3 broad ovate acute teeth half as long as the tube; standard orbicular, emarginate at apex, 7 mm. in diameter, reflexed from below the middle, thickened along the zone of flexure, an intramarginal auricle on each side near the base, the stipe short and broad; wings obovate, 1 cm. long, the blade right-angled at base, the margin inrolled, the slender stipe 3 mm. long; keel cylindric, oblique at orifice, the tip with 2 close coils, a small projection on the upper side of each petal near the base; filament of free stamen thick at base; style beard short and sparse, the tip extending beyond the lateral stigma; immature pod linear, compressed, straight-beaked, glabrous, 4-seeded.

Type in the U. S. National Herbarium, no. 763708, collected in the mountains near Talpa, Jalisco, Mexico, March 7, 1897, by E. W. Nelson (no. 4030).

Phaseolus revolutus Piper, sp. nov.

Stems slender, terete, puberulent with spreading minute hairs; stipules triangular, acute, glabrous, 3 mm. long; petioles glabrous, shorter than the leaflets; stipels linear, curved, minute; leaflets linear, 1-nerved, obtuse and short-apiculate, glabrous, dark green above, paler beneath, the margin narrowly revolute and closely appressed, 5 to 7 cm. long, 4 mm. wide, the midrib with a narrow flange-like margin its whole length; peduncels elongate, much longer than the leaves, puberulent like the stems, bearing racemes of 5 to 8 flowers; bracts ovate, acute, puberulent, 1 to 2 mm. long; pedicels 1 to 3 times as long as the calyx; bracteoles ovate, minute, one-sixth as long as the calyx; calyx campanulate, puberulent, 5 mm. long, the upper lip emarginate, the lower with 3 ovate obtuse teeth about

half as long as the tube; corolla 12 mm. long; standard orbicular, stipitate, thickened and reflexed below the middle, a pair of intramarginal auricles near the base; wings oblong, stipitate, a short lobe on the upper basal angle; keel narrow, stipitate, the tip with 2 complete close coils.

Type in the herbarium of the Muséum d'Histoire Naturelle, Paris, labeled "Provenant de l'herbier Pavon, 1868, No. 68." It is probable that the specimen is from Peru.

Phaseolus oligospermus Piper, sp. nov.

Herbaceous vine; stems terete, covered with short spreading rusty hairs when young; petioles rusty-pilose, nearly as long as the leaflets; stipules narrowly triangular, acute, pubescent, 3 mm. long; stipels similar, 2 mm. long; leaflets membranaceous, ovate, truncate to broadly cuneate at base, acuminate, the tip acute, pubescent with sparse short hairs on both sides, paler beneath, 3 to 5 cm. long; peduncles rusty-puberulent, about as long as the leaves; racemes few-flowered; pedicels as long as the calyx or in fruit 1 cm. long; primary bracts triangular-lanceolate, acute, rusty-pubescent, 5-nerved, 5 to 6 mm. long, persisting; bracteoles lanceolate, strongly 1-nerved, two-thirds as long as the calyx; calyx campanulate, pubescent with reddish hairs, the lips subequal, the upper broad and emarginate, the lower with 3 triangular acute teeth, the middle one longest; corolla evidently purple, striate with darker veins; standard orbicular, 12 mm. long, sharply reflexed, short-stipitate, bearing a transverse callosity near the angle of reflexion and a flaplike auricle on each side of the base back from the margin; wings obovate, stipitate, truncate at base, not auricled, 15 mm. long, the stipe 4 mm. long; keel tubular, not broadened in the middle, coiled at tip into 2 close turns; free stamen with a globose enlargement on the filament near the base, but not geniculate; stigma lateral behind the sterile conical tip of the style, the style bearded on the inner side a short distance below the stigma; immature pods linear, beaked, densely covered with ferruginous hairs, few-ovuled.

Type in the herbarium of the Royal Botanic Gardens, Kew, collected at Cartago, Costa Rica, in 1857, by Oersted.

Phaseolus macrolepis Piper, sp. nov.

Herbaceous vine; stems slender, terete, sparsely strigillose with reflexed hairs, apparently about a meter high; stipules oblong, acutish, 7-nerved, 3 to 4 mm. long, persistent; petioles slender, puberulent, shorter than the leaflets; stipels oblong, broadest at base, acute, 3-nerved; leaflets membranaceous, thin, angularly ovate, long-acuminate and apiculate, truncate at base, sparsely strigillose on both sides, not paler beneath, 7 to 9 cm. long; peduncles 10 cm. long; racemes with few crowded flowers; bracts elliptical, long-acuminate, faintly nerved, strigillose, persistent, concealing the full-grown flower buds, 15 mm. long; pedicels puberulent, 8 mm. long; bracteoles ovate, obtuse, one-fifth as long as the calyx; calyx campanulate, 4 mm. long, puberulent, the upper lip emarginate, much shorter than the tube, the lower with 3 broad obtuse teeth not half as long as the tube; corolla apparently red or violet, 2 cm. long; wings apparently a little longer than the standard; keel with one complete close coil; pods not seen.

Type in the herbarium of the Royal Botanic Gardens, Kew, collected on a ridge above Calderas, Volcán de Fuego, Guatemala, altitude 2,490 meters, October 20, 1873, by Salvin. A second specimen from apparently the same locality was collected in 1861 by Salvin and Godman.

The species is very distinct in its large foliaceous bracts, and is perhaps nearest related to *P. vulgaris* L. The leaflets are much like those of *P. lunatus* L. Because of the paucity of material, no dissection of the flower was attempted.

Phaseolus xanthotrichus Piper, sp. nov.

Herbaceous vine; stems slender, terete, pilose with spreading yellow-brown hairs; stipules ovate, acutish, pubescent above, glabrous beneath, prominently

7-nerved, 3 mm. long; petioles pilose like the stems, shorter than the leaflets; lower pair of stipels ovate, 1-nerved, the upper ones much narrower; leaflets membranaceous, ovate, acuminately narrowed to a blunt apiculate tip, broadly rounded at base, 3-nerved, strigose-pilose on both surfaces but more densely near the margins above, 2 to 3 cm. long; peduncles slender, pilose, 2 to 3 cm. long; racemes loosely few-flowered; primary bracts elliptic, acute, 1 to 3 nerved, ciliate with a few hairs, 2 mm. long; pedicels slender, twice as long as the calyx; bracteoles minute, ovate, soon falling; calyx campanulate, pilose, 3 mm. long, the upper lip very short, emarginate, the lateral teeth rounded, the median acute, all 3 about half as long as the tube; corolla 13 mm. long; standard orbicular, emarginate, sharply reflexed at the middle, cuneate at base, without auricles, bearing at the middle 2 linear callosities, the stipe short and broad; wings oblong, long-stipitate, without auricles; keel spiral with two and one-half close coils; vexillar stamen free; stigma terminal, oblique, the style sparsely hairy in the uppermost coil; pods linear, falcate, compressed, glabrous, 8 to 10-seeded, 4 cm. long, the beak short.

Type in the U. S. National Herbarium, no. 247544, collected at Laguna de Ayarza, Jalapa, Guatemala, October, 1892, by *Heyde & Lux* (no. 4171); distributed as *P. lunatus* L.

COSTA RICA: Cartago, *Pittier & Durand* 8999 (B, N).

Phaseolus spiralis Piper, sp. nov.

Herbaceous vine; stems slender, terete, sparsely puberulent; stipules broadly triangular, acute, 7-nerved, glabrous; petioles sparsely puberlent, shorter than leaflets; stipels ovate-oblong obtuse, 3 or 4 nerved; leaflets membranaceous, ovate, acuminate, with an apiculate tip, rounded to cuneate at base, sparsely strigillose above, paler and glabrous beneath, 4 to 5 cm. long; peduncles shorter than or equaling the leaves; racemes with 6 to 10 rather crowded flowers; bracts and bracteoles not seen, fugacious; pedicels glabrous, as long as the calyx; calyx campanulate, ciliolate, 5 mm. long, the upper lip emarginate, the lower 3-lobed, the lobes ovate, obtuse, the median longest and about one-fourth as long as the tube; standard twisted in 2 complete turns, about 14 mm. long when straightened, thickened and sharply reflexed toward base, not auricled, the stipe very short; wings 14 mm. long, much shorter than the keel, slender-stipitate, the blade oblong, curved, involute on the margins, a short blunt lobe on the upper side near the base; keel narrow, slightly broadened at base, short-stipitate, twisted in one loose turn, the tip deflexed; stamens oblong, yellow; style slender, terete, sparsely bearded on the inner side with long hairs, the extreme tip in 2 close coils; pods linear, glabrous, thick-walled, 10 cm. long, short-beaked; seeds lenticular, black and brown-marbled, 5 mm. in the broad diameter.

Type in the herbarium of the Royal Botanic Gardens, Kew, collected in the woods of Paraná, Argentina, by Tweedie.

Closely resembling *P. cochleatus* Vell., but differing in its leaflets, short racemes smaller flowers, and coiled keel.

Phaseolus rigidus Piper, sp. nov.

Shrubby, with erect or spreading branches, 30 cm. high or perhaps more; stems terete, pilose with rusty hairs; stipules broadly lanceolate, acute, 7 to 9 striate, 3 mm. long; petioles pubescent like the stems, shorter than the leaflets; stipels oblong, 3-striate, quickly deciduous; leaflets firm, ovate-oblong, the lateral slightly oblique, obtuse and minutely apiculate, cuneate or rounded at base, 3-nerved, reticulate and prominently veined, especially beneath, sparsely appressed-pubescent on both sides, 4 to 5 cm. long, not paler beneath; peduncles a little longer than the leaves, pubescent with reflexed hairs; racemes short, few-flowered; pedicellar glands prominent; bracts not seen; flowers sessile; bracteoles oval, obtuse, 9-nerved, 3 mm. long; calyx 5 mm. long, shallow, campanulate, very

oblique, sparsely appressed-pubescent, ciliate, the upper lip as long as the tube and bidentate, the lower lip with 3 lanceolate teeth twice as long as the tube; corolla 3 cm. long; standard orbicular, emarginate; wings oblong, longer than the standard; keel spiral, with one and one-half close turns; ovary linear, glabrous.

Type in the U. S. National Herbarium, no. 1,155,906, collected at Milluhuaya, La Paz, Bolivia, altitude 1,300 meters, December, 1912, by Otto Buchtien (no. 4600).

BOLIVIA: Without locality, *Bang* 2269 (N).

Phaseolus pachyrhizoides Harms, Notizbl. Bot. Gart. Berlin **7**: 504. 1921.

The type is from Huacapistana, Junín, Peru. The species has been collected recently at Cani, near Mito, Junín, Peru (*Macbride* 3442).

Phaseolus anisotrichos Schlecht. Linnaea **12**: 326. 1838.

? *Phaseolus leptostachyus* Benth. Ann. Wien. Mus. Naturg. **2**: 136. 1840.

Phaseolus fulvus T. S. Brandeg. Univ. Calif. Publ. Bot. **4**: 87. 1910.

This species is abundant through much of Mexico and Central America. In all its variations it is easily distinguishable by its rather large, setose-ciliate bracts.

P. leptostachyus Benth. is probably the same as *P. anisotrichos*, as are all the specimens at Kew so labeled, and cited by Hemsley in the Biologia Centrali-Americana. The type of *P. leptostachyus* has not been examined, however.

Phaseolus anisotrichos incisus Piper, subsp. nov.

Leaflets incisely 3-lobed from near the base, the central lobe 2 or 3 times as long as the lateral ones.

Type in the U. S. National Herbarium, no. 301734, collected near Plateado, Zacatecas, Mexico, September 4, 1897, by J. N. Rose (no. 2801).

Incision of leaflets is a rare variation in *Phaseolus*. In the species the leaflets are entire or obscurely 3-lobed by the broadening of the basal angles.

Phaseolus tuerckheimii Donn. Smith, Bot. Gaz. **56**: 54. 1913.

Phaseolus chiriquinus Standl. Contr. U. S. Nat. Herb. **18**: 109. 1916.

Phaseolus adenanthus Meyer, Prim. Fl. Esseq. 239. 1818.

Phaseolus cuernavacanus Rose, Contr. U. S. Nat. Herb. **8**: 311. 1905.

Phaseolus occidentalis Rose, Contr. U. S. Nat. Herb. **8**: 312. 1905.

The synonymy of this widespread American species, now introduced generally in the Old World tropics, contains about 15 names, to which the above two must apparently be added. The species is variable in its leaflets and pubescence, but the calyx character holds remarkably true. Two of the extreme variants are worthy of nomenclatorial recognition.

Phaseolus adenanthus latifolius (Benth.) Hassler, Candollea **1**: 443. 1923.

Phaseolus latifolius Benth. Ann. Wien. Mus. Naturg. **2**: 139. 1840.

Phaseolus truxillensis forma *velutinus* Chod. & Hassl. Bull. Herb. Boiss. II. **4**: 908. 1904.

This differs from *P. adenanthus* only in the dense, rather tomentose pubescence.

MEXICO: Tequila, Jalisco, *Pringle* 4615 (N). Cerro Verde, Michoacán or Guerrero, *Langlassé* 582 (K, G). Mirador, Veracruz, *Sartorius* (N).

ECUADOR: Portovelo, *Hitchcock* 21230 (N).

PARAGUAY: Ypacaray, *Hassler* 11589 (N). Without locality, *Page* (N); *Morong* 198 (N).

BRAZIL: Caldas, Minas Geraës, *Regnell* 1125 (K).

The broken distribution of var. *latifolius* rather tends to emphasize that it is a mere variant of *P. adenanthus*.

Phaseolus adenanthus radicans (Benth.) Hassler, Candollea **1**: 443. 1923.

Phaseolus radicans Benth. Ann. Wien. Mus. Naturg. **2**: 138. 1840.

Phaseolus barbulatus Benth. Wien. Mus. Naturg. **2**: 138. 1840.

Phaseolus truxillensis minor Benth. in Mart. Fl. Bras. **15**[1]: 186. 1859.

A variant with creeping stems which root at each joint, small leaflets, and smaller flowers.

This occurs in Guatemala (Cerro Redondo, *Heyde & Lux* 6121, N), and Costa Rica (Nicoya, *Tonduz* 13563, N), as well as in Brazil.

Phaseolus microcarpus Mart. Amoen. Bot. Monac. 18. 1829–31.

Phaseolus monospermus Robins. & Greenm. Proc. Amer. Acad. **29**: 385. 1894.

This peculiar species has pods much like those of *Meibomia*. The type of *P. microcarpus* was grown from seed collected by Karwinsky at Tlalpujahua, Mexico, the specimen in the Jardin de Botanique, Brussels.

PUEBLA: Tehuacán, *Purpus* 5780 (N). Coxcatlán, *Purpus* 4203 (N).

JALISCO: Tequila, *Pringle* 5446 (type of *P. monospermus*, G).

OAXACA: Monte Alban, *Smith* 931 (N). Valley of Oaxaca, *Nelson* 1308 (N).

GUERRERO: Acapulco, *Palmer* 524 (N).

Phaseolus linearis H. B. K. Nov. Gen. & Sp. **6**: 445. 1823.

Phaseolus elongatus Rose, Contr. U. S. Nat. Herb. **8**: 311. 1905.

The species is known from Mexico, Panama, Colombia, Guiana, Venezuela, Peru, Bolivia, Brazil, and Paraguay.

Phaseolus linearis coriaceus (Desv.) Chodat & Hassl. Bull. Herb. Boiss. II. **4**: 908. 1904.

Phaseolus coriaceus Desv. Ann. Sci. Nat. **9**: 419. 1826.

Phaseolus asper Benth. Ann. Wien. Mus. Naturg. **2**: 139. 1840.

Phaseolus linearis latifolius Benth. in Mart. Fl. Bras. **15**[1]: 187. 1859.

This is merely a variant with broad leaflets. Every form from linear to broadly oblong or ovate occurs. Hassler (Candollea **1**: 445. 1923) refers here *P. violaceus* Vell. (Fl. Flum. 311. *pl. 124*. 1825), a disposition with which I do not agree.

INDEX

[Synonyms are in italic type. The page numbers of the principal entries are set in heavy-faced type.]

	Page
Adenodolichos	663
Alepidocalyx	663, **672**
amblyosepalus	**672**
anisophyllus	**672**
parvulus	**672**
Ceratotropis, section	682
Chloryllis	663
Choncho	670
Cochliasanthus, section	677
Condylostylis	663, **667**
phlebophylla	**668**
venusta	**667**
Dioclea trinervia	664
Dolichopsis	663, 665
Dolichos	663
Dyslobium	663
Euphaseolus, section	696
Kerstingiella	663
Lasiospron, section	677
Macroptilium, section	680
Microcochle, section	679
Minkelersia	663, **670**, 672
biflora	670, 671
galactoides	670, **671**
multiflora	**671**, 672
pauciflora	**671**
vulcanica	**671**
Monoplegma	663, **664**
sphaerospermum	664
trinervium	**664**
Otoptera	663, 665
Oxyrhynchus	663
Pachyrhizus	663
angulatus	677
Phaseolus	663, 672, 673
acutifolius	**693**
tenuifolius	693
adenanthus	**700**
latifolius	**700**
radicans	**701**
affinis	**682**
amplus	675
angustissimus	**687**
latus	687
anisotrichos	**700**
incisus	**700**
antillanus	674
appendiculatus	**675**, 676
asper	701
atropurpureus	**680**, 681, 682
ecuadoriensis	682
sericeus	681
aureus	682
balansae	678
bertonii	677

	Page
Phaseolus—Continued.	
bilobatus	680
bolivianus	**694**
brevicalyx	**695**
buseri	670
campestris	**678**
candidus	675
canescens	680
caracalla	**677**
caracallensis	677
chiriquinus	700
clitorioides	**675**
coccineus	**685**
cochleatus	**676**, 699
coriaceus	701
cuernavacanus	700
dilatatus	687
dysophyllus	680, 681
elegans	**674**
elongatus	701
esperanzae	**692**
falciformis	**693**
filiformis	**687**
firmulus	674
flavescens	**686**
floribundus	**690**, 692
foliaceus	**689**
formosus	**684**
fraternus	**679**
fulvus	700
glabellus	**683**
glaber	683
gracilis	**680**
grandiflorus	**677**
grayanus	687, **692**
griseus	**683**
halophilus	**675**
hernandezii	682
heterophyllus	**680**, 695
rotundifolius	**680**
hirsutus	**678**
intonsus	**696**
jaliscanus	**697**
juruanus	678
lanceolatus	679
lasiocarpus	678
balansae	678
igatimianus	678
latidenticulatus	674
latifolius	693, 700
laxiflorus	**692**
leiosepalus	**685**
leiospermus	668
leptostachyus	700
leucanthus	**686**

	Page
Phaseolus—Continued.	
ligulatus	**676**
linearis	677, **701**
coriaceus	**701**
latifolius	701
violaceus	677
lobatus	**677**
longepedunculatus	680, 681, 682
longifolius	678
longirostratus	677
lozanii	669
lunatus	**694**, 698, 699
macrolepis	**698**
macropoides	680
macropus	680
maculatus	688
maritimus	675
megatylus	**675**
membranaceus	675
maritimus	675
metcalfei	687, **688**
micranthus Hook. & Arn	**695**
micranthus Mart. & Gal	680, 695
microcarpus	**701**
mollis	**693**
monophyllus	680
rufus	680
monospermus	701
multiflorus	685
mungo	682
oaxacanus	**691**
obliquifolius	674
oblongifolius	675
obvallatus	**684**
occidentalis	700
oligospermus	**698**
opacus	**695**
ovatifolius	**688**
ovatus	678
glabratus	679
pachyrhizoides	**700**
palmeri	**691**
parviflorus	680
parvulus	672
pauciflorus	668
pedatus	**679**
pedicellatus	684, 688, **691**
peduncularis	674, 675
clitorioides	675
pilosus	**678**, 696
pius	674
polyanthus	**685**
polymorphus	**691**
proriferus	684
pulchellus	**674**
purpusi	691
retusus	688
revolutus	**697**
rigidus	**699**
robustus	**676**

	Page
Phaseolus—Continued.	
rosei	**694**
rotundifolius	680
rubidus	**680**
rufus	680
salicifolius	**692**
savannarum	680
scabrellus	**691**
schaffneri	**690**
schiedeanus	680
schottii	**678**
campestris	678
scolecocarpus	**681**
semierectus atropurpureus	681
sempervirens	**697**
speciosus	**674**
spiralis	**699**
strigillosus	**685**
sylvestris	684
tenellus	**696**
tenuifolius	693
trichocarpus	679
truxillensis velutinus	700
tuerckheimii	**700**
venosus	**687**
vestitus	**681**, 693
vignoides	**676**
violaceus	677, 701
viridis	**693**
vulgaris	698
xanthotrichus	**698**
wrightii	**687**
Physostigma	663
Plectrotropis	663
Psophocarpus	663
Ramirezella	663, 665, **669**
buseri	**670**
glabrata	**670**
lozanii	**669**
nitida	**669**
occidentalis	**670**
ornata	**670**
pringlei	670
pubescens	**670**
strobilophora	**670**
Sigmoidotropis, section	674
Spathionema	663
Sphenostylis	663, 665
Strophostyles	663, 668, 682
helvola	668
leiosperma	**668**
pauciflora	668
Vigna	663, 665
aristata	**665**
lonchophylla	**665**
myrtifolia	**666**
populnea	**666**
strobilophora	670
strophiolata	**666**
Voandzia	663

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CONTRIBUTIONS

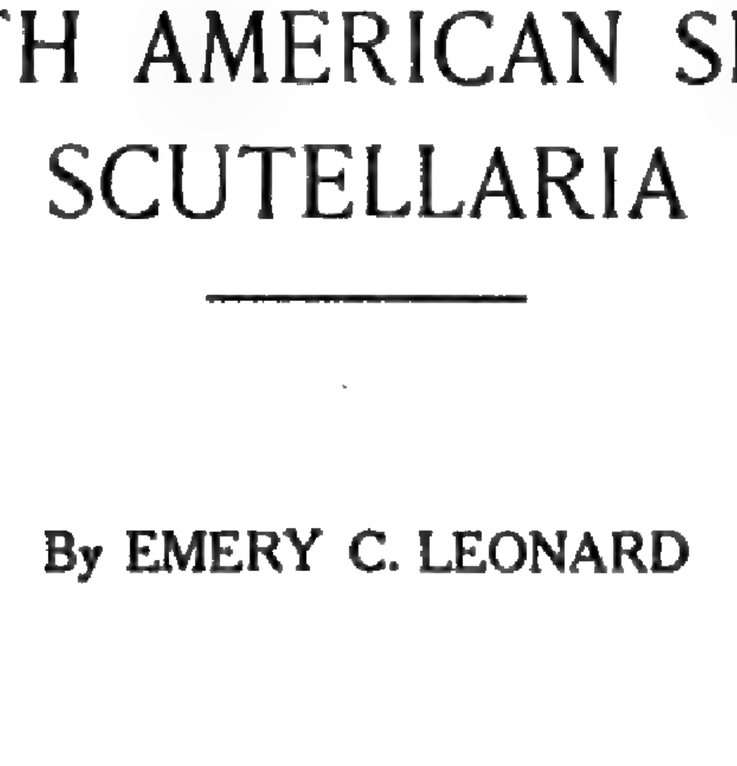
FROM THE

UNITED STATES NATIONAL HERBARIUM

VOLUME 22, PART 10

THE NORTH AMERICAN SPECIES OF SCUTELLARIA

By EMERY C. LEONARD



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PREFACE

This part of the Contributions from the United States National Herbarium consists of an account of the North American species of *Scutellaria*, or skullcap. This group of the Mint Family is generally distributed in temperate and tropical America, and also in the Old World. No full account of the North American species has appeared since Bentham's monograph of the Labiatae in De Candolle's Prodromus in 1848. Later exploration has increased greatly the number of known North American species.

In the present revision no new species have been found from the United States, but much study has been necessary in order to treat satisfactorily the numerous older names, especially because of the inconstancy that seems to prevail in the characters of these species. Recent explorations in little-known parts of the tropical region of North America have produced material from which several new species are here described.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

CONTENTS

	Page
Introduction	703
Systematic treatment	705
Doubtful species	747
Index	vii

THE NORTH AMERICAN SPECIES OF SCUTELLARIA

By EMERY C. LEONARD

INTRODUCTION

The genus of mints which we now call *Scutellaria* was first described by Tournefort in 1700,[1] under the name *Cassida*. Of the Tournefortian references to the species of this genus the oldest (1581) is to the *Lysimachia galericulata* of Lobelius' Icones,[2] which seems to be the first published reference to any plant now classified under *Scutellaria*.

The name *Scutellaria* itself, first proposed in 1735 by Rivin,[3] was taken up by Linnaeus [4] in 1753, 12 species being ascribed to the genus. Of these, *S. lateriflora*, *S. integrifolia*, and *S. hyssopifolia* are native to North America; the remaining species are European or Asiatic. *S. hyssopifolia* has, however, been proved synonymous with *S. integrifolia*.

Scutellarias are now known to occur in nearly every temperate and tropical region of the world, excepting central and southern Africa, and there has been a steady increase in the number of recognized species from 1753 to the present time, as may be seen from the following table:

	North America	South America	Old World	Total
Linnaeus,[1] 1753	3	----	9	12
Hamilton,[2] 1832	16	5	27	48
Bentham,[3] 1832	21	8	29	58
Bentham,[4] 1836	23	10	30	63
Bentham,[5] 1848	25	16	45	86
Briquet,[6] 1895	----	----	----	180
Index Kewensis and supplements, 1893–1915	75	24	150	249
Present revision, 1926	62	----	----	----

[1] L. Sp. Pl. 598–600.
[2] Seringe, Bull. Bot. 271–326.
[3] Bot. Reg. **18**: under *pl. 1493*.
[4] Benth. Labiat. Gen. Sp. 419–445.
[5] In DC. Prodr. **12**: 412–431.
[6] In Engl. & Prantl, Pflanzenfam. **4**[3a]: 225–227.

In his monograph of the genus Hamilton proposed three sections, which he called *Lupulinaria*, *Stachymacris*, and *Galericularia*. The

[1] Inst. Herb. 1: 181.
[2] Pl. Stirp. Icon. 344.
[3] L. Syst. Nat. 1735.
[4] L. Sp. Pl. 598–600.

first, characterized by large, imbricate, and usually membranaceous bracts, is represented entirely by Old World species; the sections *Stachymacris* and *Galericularia* correspond to the paniculate and axillary sections, respectively, of the blue-flowered group in the present revision.

Four years later came Bentham's Labiatae, in which is found a full and comprehensive treatment of the genus. In addition to the three sections devised by Hamilton two others are proposed, *Heteranthesia* and *Maschalostachys*. The first, composed chiefly of red-flowered plants of tropical America, differs from the other sections in having the flowers, or at least the uppermost ones, scattered instead of opposite. The section *Maschalostachys* is intermediate between *Stachymacris* and *Galericularia*, in that the single axillary flowers characteristic of *Galericularia* are replaced by racemes. This section is represented in America by *S. lateriflora*.

In 1924 Penland published [5] a revision of the species of the United States. This work is unique in that the key is based wholly on nutlet characters. A number of interesting facts have been brought to light in this new treatment, but the work is not altogether satisfactory for general use, since it is not always possible to procure mature nutlets for study.

The word *Scutellaria* has been derived from two possible sources,[6] *scutella* (a small dish) and *scutellum* (a little shield), both of which are suggested by the peculiar shape of the calyx. The older term, *Cassida*, meaning "helmet," alluded to the shape of the upper part of the calyx. Tournefort and his contemporaries applied the vernacular name "la toque"—a small hat worn in the sixteenth century by both men and women—again in allusion to the upper lip of the calyx, and in a somewhat similar fashion the plants are called by present-day writers "skullcap."

These plants form a natural and well-defined genus, but many of the species are variable and difficult to distinguish, especially since the distinguishing characters are taken chiefly from the shape of the leaves, the nature of the pubescence, the arrangement of the inflorescence, and the color of the flowers. Bentham suggested [7] that reliable characters might perhaps be found in the lobing of the corolla, but an examination of softened flowers of numerous specimens has failed to reveal any constant specific differences of this sort. The lobing of the corolla sometimes shows as great a range of variation within the same species as between different species. If slight and variable vegetative differences are considered as consti-

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[5] Rhodora **26**: 68. 1924.

[6] Rees Cycl. **32**. 1819.

[7] Benth. Labiat. Gen. Sp. 420. 1836.

tuting the specific characters, it is possible to maintain a large number of species; but if less weight is given to these characters, a small number of highly diverse species will be recognized. The writer has chosen an intermediate course between these two extremes, giving specific rank to certain well-known varieties, but reducing other species based on too slight a differentiation.

The nomenclature of the species in the United States has been well established, and the material in herbaria for the most part has been found correctly named. For Mexico and Central America, however, the nomenclature has been found to be in a chaotic state, and as a consequence many of the specimens in American herbaria are unidentified or incorrectly named.

Except for a few species, such as *S. ventenatii* and *S. splendens*, which may be used for ornamental purposes, none of the Scutellarias have any economic value. They are variable in their habitat, growing in thickets, among rocks, in meadows, and along streams and roads, but they are seldom abundant and never become persistent or pernicious weeds.

Through the kindness of the curators of the New York and the Missouri Botanical Gardens, the Gray Herbarium, and the Academy of Natural Sciences of Philadelphia, the writer has been able to examine much material in addition to that in the United States National Herbarium. The privilege of studying type specimens represented only in these herbaria has been particularly helpful in the preparation of this revision.

SYSTEMATIC TREATMENT

KEY TO THE SPECIES

Flowers yellow or whitish.
- Plants shrubby---------- **1. S. suffrutescens.**
- Plants herbaceous.
  - Inflorescence paniculate; corolla 2 to 2.5 cm. long.
    - Leaves thick, densely velvety-hirsute---------- **2. S. lutea.**
    - Leaves thin, puberulent or finely pubescent.
      - Stems puberulent; leaf blades averaging 1.5 cm. in width. **3. S. orichalcea.**
      - Stems pubescent; leaf blades averaging 6 cm. in width. **4. S. aurea.**
  - Inflorescence axillary; corolla 1 to 1.2 cm. long.
    - Leaves entire---------- **5. S. nana.**
    - Leaves (at least the lowermost) toothed.
      - Leaf blades cordate at base, pubescent with soft spreading hairs. **6. S. bolanderi.**
      - Leaf blades narrowed at base, pubescent with minute curved hairs. **6a. S. bolanderi californica.**

Flowers not yellow.
Flowers red or reddish purple.
Flowers reddish purple.
Racemes elongate (15 to 20 cm. long) ; corolla over 2 cm. long.
7. S. rosea.
Racemes short (2 to 4 cm. long) ; corolla less than 2 cm. long.
Floral bracts orbicular; stems usually branched_____ 8. S. seleriana.
Floral bracts lanceolate; stems usually simple.
Leaves firm, canescent_____ 9. S. guatemalensis.
Leaves thin, nearly glabrous____ 45a. S. purpurascens heterophylla.
Flowers red.
Leaves panduriform, cordate at base, at least twice as long as wide.
Stems minutely puberulent_____ 10. S. costaricana.
Stems glabrous or subglabrous_____ 11. S. glabra.
Leaves not panduriform, if twice as long as wide not cordate.
Leaves, at least some of them, cordate.
Leaves rather finely dentate with numerous unequal teeth; racemes elongate; Mexico_____ 12. S. splendens.
Leaves coarsely crenate-dentate or crenate with relatively few teeth; racemes usually short; chiefly Central America and West Indies.
Leaves pubescent with short inconspicuous hairs or nearly glabrous; plants usually erect.
Inflorescence pubescent with white hairs____ 13. S. ventenatii.
Inflorescence puberulent with minute brown hairs.
15. S. longifolia.
Leaves densely canescent; plants often decumbent__ 14. S. ornata.
Leaves not cordate.
Corolla not more than 2.5 cm. long, straight or but slightly curved.
Stems minutely puberulent; leaves usually over 6 cm. long; flowers numerous _____ 15. S. longifolia.
Stems pubescent; leaves usually under 6 cm. long; flowers few.
16. S. maxonii.
Corolla more than 2.5 cm. long, strongly curved.
Stems minutely puberulent; leaves thin_____ 17. S. formosa.
Stems pubescent above; leaves firm_____ 18. S. mociniana.
Flowers blue.
A. Inflorescence axillary, the flowers solitary or in racemes.
Flowers in axillary racemes.
Petioles short, not exceeding 4 mm.; corolla 8 to 10 mm. long.
19. S. churchilliana.
Petioles slender, usually over 15 mm. long; corolla 5 to 8 mm. long.
20. S. lateriflora.
Flowers solitary in the axils.
Corolla very small, less than 3 mm. long; leaf blades halberd-shaped.
21. S. racemosa.
Corolla more than 3 mm. long; leaves not halberd-shaped.
Leaves mainly toothed.
Plants annual; floral leaves cordate, nearly as broad as long.
23. S. cardiophylla.
Plants perennial; floral leaves narrowed at base or, if cordate, at least twice as long as broad.

Stems pubescent in lines; corolla 10 to 20 mm. long.
Upper floral leaves much smaller than the main stem leaves, distant at summit_____ 24. S. coerulea.
Upper floral leaves similar to the stem leaves, crowded at summit_____ 25. S. microphylla.
Stems not pubescent in lines; corolla 5 to 10 mm. long.
Leaf blades averaging 3 cm. in length; roots not tuberous; plants taller, usually over 10 cm.
Under surface of leaf blades velvety-pubescent; corolla 15 mm. long.
Lower leaves ovate; petioles slender, 3 to 5 mm. long. 27. S. alta.
Lower leaves oblong; petioles 1 to 2 mm. long. 26. S. epilobifolia.
Under surface of leaf blades nearly glabrous; corolla up to 1 cm. long.
Nutlets membranous-winged, on a slender base; leaf blades rounded at base_____ 22. S. nervosa.
Nutlets wingless, on a low base; leaf blades abruptly narrowed, truncate or subcordate at base. 19. S. churchilliana.
Leaf blades averaging 15 mm. in length; roots tuberous; plants lower, usually less than 10 cm. high.
Leaves petioled; plant of western United States. 28. S. tuberosa.
Leaves subsessile; plant of eastern and central United States. 33. S. parvula.

Leaves mainly entire.
Corolla 20 mm. long or more.
Leaves narrowly linear, less than 4 mm. wide__ 60. S. floridana.
Leaves not narrowly linear, more than 4 mm. wide.
Stems cespitose; roots fibrous; leaves strongly punctate. 29. S. bushii.
Stems not cespitose; roots slender or thickened; leaves not strongly punctate.
Plants canescent; calyx glandular. 30a. S. angustifolia canescens.
Plants minutely puberulent; calyx not glandular.
Leaves linear, usually 6 times longer than broad; upper lip of corolla much longer than the lower; stamens usually exserted_____ 30b. S. angustifolia austinae.
Leaves oblong-ovate to elliptic; lips of corolla equal; stamens not exserted.
Upper stem leaves similar to the lower spreading leaves, the veins seldom prominent; plant of Idaho, Washington, Oregon, and California_ 30. S. angustifolia.
Upper stem leaves more crowded and pointed than the lower, the veins prominent; plant of Wyoming and Colorado.
Leaf blades firm, less than 25 mm. long. 31. S. brittonii.
Leaf blades thin, over 25 mm. long. 31a. S. brittonii virgulata.

Corolla less than 15 mm. long.
Under surface of leaf blades sparsely pubescent, the hairs confined chiefly to the veins.
Stems from a woody base; Mexican species_ 32. S. hispidula.
Stems from moniliform rootstocks; United States species.
Stems pubescent, glandular _____ 33. S. parvula.
Stems puberulent, not glandular_____ 34. S. ambigua.
Under surface of leaves uniformly and closely pubescent.
Calyx glandular.
Plants from slender, usually tuberous-thickened rootstocks.
Leaves mostly truncate or subcordate at base; eastern United States species_____ 33. S. parvula.
Leave mostly narrowed at base; western United States species_____39a. S. antirrhinoides sanhedrensis.
Plants annual or perennial with woody base.
Larger leaves less than 10 mm. long, puberulent.
35. S. potosina.
Larger leaves over 10 mm. long, pubescent.
36. S. drummondii.
Calyx not glandular.
Plants with fibrous roots; southern United States, Mexico, and West Indies.
Leaves sessile, entire, crowded; throat of corolla 5 to 6 mm. broad _____ 37. S. resinosa.
Leaves petioled, shallowly toothed, distant; throat of corolla 2 to 3 mm. broad_____ 42. S. havanensis.
Plants with tuberous-thickened roots; western United States.
Leaves upright, coriaceous, crowded; branches numerous, crowded_____ 38. S. nevadensis.
Leaves spreading, not conspicuously crowded or coriacious.
Plants 15 cm. high; leaves not over 15 mm. long.
39a. S. antirrhinoides sanhedrensis.
Plants normally over 15 cm. high; larger leaves 2 cm. long_____ 39. S. antirrhinoides.
AA. Inflorescence a terminal panicle or raceme.
Leaves hastate_____ 21. S. racemosa.
Leaves not hastate.
Leaves, at least some of those above the middle of the stem, cordate.
Calyx and pedicels glandular-pubescent.
Plants glabrous, sparsely pubescent, or pilose; racemes with few and mostly scattered flowers.
Stem and leaves glabrous or nearly so_____ 40. S. saxatilis.
Stem and leaves pilose_____ 40a. S. saxatilis arguta.
Plants copiously pubescent; racemes usually many-flowered.
Petioles not exceeding 5 mm_____ 7. S. rosei.
Petioles 2 cm. long or more_____ 41. S. ovata.
Calyx and pedicels not glandular.
Leaf blades not over 2 cm. long.
Under surface of leaf blades puberulent____ 42. S. havanensis.
Under surface of leaf blades (excepting larger veins) glabrous.
43. S. oaxacana.

Leaf blades, at least some of them, more than 2 cm. long.
Flowers numerous, in stout compact much-branched panicles; southeastern United States plant_____ 44. S. ocumulgee.
Flowers few, in loose panicles or racemes; Mexican or Central American plants.
Stems and veins of leaf blades puberulent with very short, brownish hairs_____ 45. S. purpurascens.
Stems and veins of leaf blades pubescent with straight or curved hairs.
Racemes short, crowded; floral bracts much longer than the pedicels_____ 43. S. oaxacana.
Racemes elongate; floral bracts small, scarcely exceeding the pedicels.
Leaf blades 4 cm. wide or less; flowers scattered. 46. S. pseudo-coerulea.
Leaf blades, at least some of them, more than 4 cm. wide; flowers crowded_____ 47. S. vitifolia.
Leaves above the middle of the stem abruptly or gradually narrowed at base.
Leaves all toothed.
Calyx glandular.
Lower leaves crowded, longer than the internodes; floral bracts gradually intergrading with the stem leaves. 48. S. arenicola.
Lower leaves shorter than the internodes; floral bracts abruptly smaller than the stem leaves.
Corolla more than 2 cm. long; larger leaf blades more than 4 cm. long_____ 49. S. montana.
Corolla 1.5 cm. long or less; leaf blades usually less than 4 cm. long_____ 50. S. ovalifolia.
Calyx not glandular.
Leaf blades 2.5 cm. long or less; species of Mexico and Central America.
Corolla glandular; flowers crowded; upper leaves as large as the lower_____ 51. S. chalicophila.
Corolla not glandular; flowers distant; leaves gradually reduced toward the summit.
Plants glabrous or nearly so_____ 52. S. affinis.
Plants hirtellous_____ 53. S. gaumeri.
Leaf blades mostly 3–8 cm. long; United States species.
Inflorescence racemose _____ 54. S. serrata.
Inflorescence paniculate.
Calyx densely and finely canescent.
Under surface of leaf blades finely and densely canescent. 55. S. incana.
Under surface of leaf blades (excepting the larger pubescent veins) glabrous_____ 56. S. punctata.
Calyx pubescent with short curved hairs.
Corolla averaging 2 cm. in length__ 57. S. mellichampii.
Corolla averaging 1 cm. in length_____ 58. S. altamaha.
Leaves above the middle of the stem entire. (Upper stem leaves of *S. integrifolia major* are often remotely toothed.)
Corolla glabrous_____ 59. S. glabriuscula.

Corolla pubescent.
Lower leaves entire.
Leaves narrowly linear_____ 60. S. floridana.
Leaves oval or elliptic.
Corolla over 1.5 cm. long, pubescent_____ 61. S. brevifolia.
Corolla 1.5 cm. long or less, glandular__ 51. S. chalicophila.
Lower leaves more or less toothed_____ 62. S. integrifolia.

1. Scutellaria suffrutescens S. Wats. Proc. Amer. Acad. **25**: 160. 1890.
Scutellaria spinescens Fernald, Proc. Amer. Acad. **45**: 416. 1910.

Plant 10 to 20 cm. high, woody below, much branched above, the branches rigid, puberulent (sometimes glandular), and relatively short; leaves sessile or short-petioled; leaf blades ovate to oblong-ovate, the larger lower ones 10 mm. long and 4 mm. wide, gradually reduced toward the summit to small bracts, giving the plant a spiny appearance, rounded at base, obtuse at apex, entire, strongly nerved beneath, impressed-nerved above, pubescent with small white curved hairs; flowers in the axils of the upper leaves but well below the tips of the branches; pedicels 2 to 3 mm. long, puberulent and occasionally glandular; calyx 3 to 5 mm. long, sparingly pubescent, usually glandular; corolla yellow, marked with red, 1.5 to 2 cm. long, the tube slender, gradually expanding from 2 mm. at base to 3 or 4 mm. at throat, the lips equal or the upper slightly longer than the lower, the middle lobe of the upper lip notched, the lower lip ovate, crenate, slightly lobed; nutlets 1 mm. in diameter, black, granular.

TYPE LOCALITY: Bare summit of the Sierra de la Silla, Nuevo León, Mexico. Type collected June, 1889, by Pringle (no. 2536).

SPECIMENS EXAMINED:

NUEVO LEÓN: Sierra de la Silla, alt. 1,600 meters, *Pringle* 2535 (N,[8] G, type, M, P, F).

COAHUILA: San Lorenzo Canyon, 6 miles southeast of Saltillo, *Palmer* 392 (N, F, G, type of *S. spinescens*, M, Y), 394 (N, G, M, F, Y).

In Palmer's 392 and 394 the branches, leaves, and calyx are minutely and glandular-pubescent. In Pringle's 2535, however, they are merely puberulent. It is on this slight difference that Fernald bases his *S. spinescens*. The woody base and the bushy top of slender spinelike branches give this plant an appearance strikingly dissimilar from that of any other American *Scutellaria*.

2. Scutellaria lutea Donn. Smith, Bot. Gaz. **13**: 76. 1888.

Entire plant brownish velvety-pubescent; stem erect or ascending, up to 60 cm. high (entire plant not available for study), branched, glandular above; petioles up to 5 mm. long; leaf blades ovate to oblong-ovate, 1 to 2.5 cm. long, 0.8 to 2 cm. wide, narrowed or rounded at base, obtusish at apex, crenate-serrate, firm; racemes short (2 to 3 cm. long), few-flowered; bracts ovate-lanceolate, 1 to 2 mm. long, the lower crenate-serrate, the upper entire; pedicels 3 to 6 mm. long; calyx 3 to 4 mm. long; corolla yellow, 2 to 2.5 cm. long, glandular near base, the tube gradually enlarging from 1.5 mm. below the middle to 5 mm. at throat, the lips equal, the lobes of the upper lip short, the middle lobe notched, the lower lip rather narrow, ovate, entire; nutlets 1 mm. in diameter, black, granular.

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[8] The letters in parenthesis indicate the herbaria in which the specimens are found. The following abbreviations are used: N, United States National Herbarium; G, Gray Herbarium; F, Field Museum of Natural History; P, Academy of Natural Sciences of Philadelphia; M, Missouri Botanical Garden; Y, New York Botanical Garden; C, University of California.

TYPE LOCALITY: Santa Rosa, Guatemala. Type collected by Türckheim, July, 1887 (J. D. Smith, no. 1309).

SPECIMENS EXAMINED:

GUATEMALA: Cuesta de Cachil, near Salamá, Baja Verapaz, alt. 1,200 to 1,600 meters, *Pittier* 148 (N). Santa Rosa, Baja Verapaz, alt. 1,600 meters, *Türckheim* 1309 (N, type, G). Santo Tomás, Salamá, *Seler* 3406 (N, G).

This species is probably related to *S. seleriana*, as indicated by a similarity in the pubescence and shape of the leaves.

3. **Scutellaria orichalcea** Donn. Smith, Bot. Gaz. **14**: 29. 1889.

Scutellaria pedicularis Fernald, Proc. Amer. Acad. **35**: 563. 1900.

Stems tufted, erect, branched, usually purplish, 10 to 25 cm. tall, puberulent; petioles slender, 0.5 to 2.5 cm. long; leaf blades oblong-ovate, 1 to 5 cm. long, 1 to 2 cm. wide, acutish or roundish at base, obtuse at apex, remotely crenate, undulate, or entire, usually purplish, minutely puberulent on both surfaces, the upper surfaces bearing additional scattered longer hairs; racemes terminal, 1 to 3.5 cm. long, with crowded erect flowers; bracts linear or narrowly lanceolate, the smaller and uppermost not exceeding the calyx; pedicels, 3 to 5 mm. long, puberulent; calyx 3 to 4 mm. long, puberulent; corolla yellow, 2 cm. long, the tube very slender, enlarging near the throat, pubescent, the lips equal or the upper shorter and narrower than the lower, the middle lobe twice as long as the lateral lobes, the lower lip undulate, prominently 3-lobed; nutlets 1 mm. in diameter, black, granular.

TYPE LOCALITY: Chajrax, Department of Alta Verapaz, Guatemala. Type collected by Türckheim, December, 1887 (J. D. Smith, no. 406).

SPECIMENS EXAMINED:

CHIAPAS: Near Tumbala, alt. 1,300 to 1,800 meters, *Nelson* 3342 (N, type of *S. pedicularis*).

GUATEMALA: Vicinity of Secanquím, Alta Verapaz, alt. 550 meters, *Pittier* 244 (N), 187 (N). Cubilquitz, Alta Verapaz, *Türckheim* 8264 (N), II.2247 (N). Chajrax, *Türckheim* 406 (N, type).

BRITISH HONDURAS: Moho River, *Peck* 572 (G).

COSTA RICA: Laguna de la Escuadra, northeast of El Copey, Prov. San José, *Standley* 41989 (N).

Scutellaria orichalcea is a well-marked species, characterized by its purplish puberulent leaves and stems and the short terminal racemes of slender upright yellow flowers. Dried specimens of *S. longifolia* with faded flowers might be mistaken for this species, but can be separated readily by the much larger leaves and flowers and brown-pulverulent stems.

Nelson's 3342, the type collection of *S. pedicularis*, agrees with the plants here cited in every respect except that it has a slightly larger corolla.

4. **Scutellaria aurea** Robins. & Greenm. Amer. Journ. Sci. **50**: 163. 1895.

Stem erect, branched (height not known, but probably reaches 50 cm.), pubescent; petioles up to 3 cm. long, pubescent; leaf blades ovate to broadly ovate, 7 to 10 cm. long, 5 to 7 cm. wide (those of the axillary branches smaller), cordate or truncate at base, obtuse or obtusish at apex, coarsely crenate-dentate, the upper surface bright green, minutely and sparsely pubescent, the lower surface paler and more densely pubescent, especially on the veins; inflorescence of several elongate racemes (15 cm. long in specimen examined), the lowermost flowers subtended by large leaflike bracts, the succeeding ones by small acuminate bracts, the upper naked; pedicels up to 4 mm. long, finely pubescent; calyx 4 to 6 mm. long, puberulent; carolla bright orange, 2 cm.

long, finely and rather densely pubescent, the tube enlarged from 2 mm. near the base to 6 mm. at throat, the lips nearly equal, the upper broader than the lower, its middle lobe notched, the lower lip orbicular, slightly emarginate at tip, otherwise entire; nutlets 1 mm. in diameter, granular, brown.

TYPE LOCALITY: Rancho de Calderón, Oaxaca, Mexico. Type collected by L. C. Smith in 1894 (no. 173).

SPECIMEN EXAMINED:

OAXACA: Rancho de Calderón, alt. 2,160 meters, *Smith* 173 (G, type).

This species, well marked by its large, bright green, cordate leaves, is very distinct from all other yellow-flowered Scutellarias hitherto described.

4a. Scutellaria aurea conzattii Greenm. Field Mus. Bot. 2: 261. 1895.

Leaf blades lance-ovate, 2 to 7 cm. long, 1 to 3 cm. wide, entire.

TYPE LOCALITY: Cerro San Antonio, Oaxaca, Mexico.

SPECIMEN EXAMINED:

OAXACA: Cerro San Antonio, alt. 1,800 meters, *Conzatti* 1584 (F, type).

Scutellaria aurea conzattii is described by Greenman as a variety "having smaller and perfectly entire leaves."

5. Scutellaria nana A. Gray, Proc. Amer. Acad. **11**: 100. 1876.

Scutellaria footeana Mulford, Bot. Gaz. **19**: 118. 1894.

A grayish cinereous plant from a rootstock bearing subterranean moniliform tubers; stems 3 to 19 cm. high, much branched, the branches crowded, puberulent; leaves erect, usually crowded; leaf blades ovate to spatulate, 5 to 10 mm. long, 3 to 10 mm. wide, narrowed to a sessile or subsessile base, obtuse or rounded at apex, thickish, obscurely veined, cinereous-pubescent; pedicels 2 to 3 mm. long; calyx 3 to 4 mm. long; corolla yellow, 10 to 12 mm. long, cinereous-pubescent, the tube rather broad, expanding somewhat abruptly from 2 to 2.5 mm. at or below the middle to 5 mm. at throat, the lips about equal, the middle lobe of the upper lip notched, the lower lip ovate, shallowly 3-lobed, entire; nutlets 1 mm. in diameter, strongly tuberculate.

TYPE LOCALITY: Winnemucca Valley near Pyramid Lake, northwestern Nevada. Type collected by J. G. Lemmon.

RANGE: Wyoming, Nevada, Oregon, and California.

Scutellaria nana is readily distinguished by its cinereous and usually dwarfed, erect, crowded, leafy branches. Whited's 3125 and Leiberg's 472, collected in Crook County, Oregon, differ from the usual form in their relatively narrower, more distant leaves and their longer, less crowded branches.

The type of *S. footeana* was collected near Black Canyon, Idaho. In her remarks following the description, Miss Mulford points out the relationship with *S. nervosa* and the Japanese *S. guilielmi*, because of the slender gynobase on which the nutlets are raised. This character, however, applies to *S. nana* as well, and, except for its larger leaves, the type specimen agrees perfectly with the rather ample material of *S. nana* in the U. S. National Herbarium.

6. Scutellaria bolanderi A. Gray, Proc. Amer. Acad. **7**: 387. 1868.

A pubescent plant 10 to 50 cm. high, from a slender rootstock; stem weak, simple or branched, erect, ascending, or occasionally prostrate with erect or ascending branches, leafy to the summit; leaves subsessile or short-petioled, slightly reduced toward the summit; leaf blades oblong, 1 to 4 cm. long, 0.5 to 2 cm. wide, truncate or cordate at base, obtuse or rounded at apex, entire or coarsely crenate, sparingly pubescent; flowers usually few, in the axils of the upper leaves; pedicels 2 to 3 mm. long; calyx 3 to 4 mm. long; corolla dull yellow or whitish, 1 to 1.2 cm. long, finely pubescent, the tube gradually

expanding from 2 mm. at base to 6 mm. at the ampliate throat, the upper lip much smaller than the lower, the middle lobe notched, the lower lip broadly ovate, undulate, shallowly 3-lobed; nutlets 1 mm. in diameter, rugose.

TYPE LOCALITY: Clarks Meadows, Mariposa County, California. Type collected by Bolander.

SPECIMENS EXAMINED:

CALIFORNIA: Clarks Meadows, *Bolander* 5006 (N, type collection). San Diego, *Orcutt* 429 (M). Tulare County, *Culbertson* 4199 (M). San Jacinto, alt. 160 meters, *Hall* 696 (N, M). South Jackson, Amador County, alt. 400 meters, *Hansen* 448 (N, M). Mojave River, San Bernardino, *Parish* 474 (N, M). Mariposa County, *Hollick* in 1880 (M, N). Sierra Nevada, *Hall & Chandler* 39a (N, M). Without locality, *Bridges* 303 (N); *Sheldon* (Y). Little Flat Gulch above Indian Creek, Tuolumne County, alt. 380 meters, *Williamson* 167 (M).

Scutellaria bolanderi bears a close resemblance to *S. epilobifolia*, differing only in its whitish corolla and wider and shorter, round-tipped, more sparsely pubescent leaves.

6a. Scutellaria bolanderi californica (A. Gray) Penland, Rhodora **26**: 68. 1924.

Scutellaria antirrhinoides californica A. Gray, Proc. Amer. Acad. **8**: 396. 1872.

Scutellaria californica A. Gray, Syn. Fl. **2**[1]: 381. 1878.

Leaf blades oblong-ovate to elliptic, 1.5 to 3 cm. long, 0.5 to 1 cm. wide, entire or the lower shallowly toothed; corolla yellowish, the lower lip distinctly broader than long.

TYPE LOCALITY: California.

SPECIMENS EXAMINED:

CALIFORNIA: *Frémont Expedition*, 1845 to 1847 (N). Elk Mountain, northern Lake County, *Tracy* 2297 (N). Vicinity of Ione, Amador County, *Braunton* 1047 (N, M), 1017 (M). Without locality, *Vasey* in 1875 (N); *Rattan* 255 (N); *Bridges* 304 (N); *Kellogg & Harford* 740 (M). Newcastle, Placer County, *Mackie* in 1904 (N). Lake County, *Torrey* 405 (N). Anderson Valley, *Bolander* 4833 (N). San Francisco, *Schmitt* 54 (N). Round Valley, Mendocino County, *Chestnut* 8 (N). Donner Lake, Nevada County, *Hall & Babcock* 4548 (N); *Sonne* in 1888 (N), 286 (M). Mount Sanhedren along Hullville road, *Hall* 9525 (N), 4548 (M). Near Chico, Butte County, *Palmer* 2045 (N). Little Chico Creek, *Leiberg* 5006 (N). Plumas County, *Austin* (N). Little Chico, *Austin* 1825 (N), 279 (N). Lake County, *Heller* 12279 (N). Donner Lake, *Heller* 7020 (M). Sonoma County, *Heller* 5743 (M). Glenn County, *Heller* 11551a (N, M). Marin County, *Eastwood* 1530 (M). Squaw Creek, *Eastwood* 295 (N). Rockville, *Earle* in 1880 (M). Soda Springs, Nevada County, *Jones* 13485 (M). Near Calaveras, *Hooker & Gray* 11265 (M). Sequoia Region, *Hansen* 110 (M).

This variety is intermediate between *S. bolanderi* and *S. antirrhinoides*.

7. Scutellaria rosei Fernald, Proc. Amer. Acad. **35**: 563. 1900.

Stem simple, slender, 60 to 70 cm. high (only the upper portions available for study), cinereous-pubescent, glandular (at least the inflorescence); petioles 2 to 3 mm. long, pubescent; leaf blades ovate (the lower suborbicular), 4 to 6 cm. long, 3 to 4 cm. wide, rounded or subcordate at base, rounded or acutish at apex, coarsely crenate-dentate, softly and minutely pubescent on both surfaces; bracts lanceolate, 3 to 5 mm. long (lowermost foliaceous);

flowers scattered in elongate racemes; pedicels and calyx each 3 to 4 mm. long, glandular-hirsute; corolla rose-purple, 2 to 2.5 cm. long, pubescent, the tube enlarging gradually from 2 mm. at base to 3 mm. near throat, then abruptly expanding to 7 or 8 mm., the upper lip smaller and slightly shorter than the lower, its middle lobe shallowly notched, the lower lip broadly ovate, notched at apex, strongly erose; nutlets unknown.

TYPE LOCALITY; Near Colomas, Sinaloa, Mexico. Type collected by Rose in 1897 (no. 1784).

SPECIMENS EXAMINED:

SINALOA: Foothills of the Sierra Madre near Colomas, *Rose* 1784 (N, G, type).

A possible relationship between *S. rosei* and *S. ventenatii* is indicated by a similarity in the shape of the leaves and character of the pubescence. They differ, however, very greatly, since *S. rosei* has shorter petioles, longer racemes, and purple flowers instead of red. *S. rosei* bears a somewhat closer resemblance to *S. guatemalensis*, but differs from that species in its much larger flowers and longer racemes.

8. Scutellaria seleriana Loesener, Bull. Herb. Boiss. **7**: 568. 1899.

Scutellaria saxicola T. S. Brandeg. Univ. Calif. Publ. Bot. **3**: 391. 1909.

Stems erect, 5 to 40 cm. high, branched above, the branches few or sometimes numerous, usually purplish, finely white-pubescent; petioles 5 to 12 mm. long; leaf blades ovate to broadly ovate, 4 to 25 mm. wide, but usually longer than broad, narrowed or subtruncate at base, obtuse at apex, densely canescent with spreading hairs on both surfaces; bracts orbicular, entire or crenate, 2 to 4 mm. long (if larger, leaflike); flowers in short racemes or some of them in the axils of the upper leaves; pedicels and calyx 2 to 5 mm. long, canescent; corolla 10 to 15 mm. long, purple, pubescent, the tube slender, 1 to 1.5 mm. broad at base, enlarging abruptly at throat to 3 mm., the upper lip smaller than the lower, the middle lobe notched, the lower lip prominently 3-lobed, strongly undulate; nutlets about 1 mm. in diameter, black, tuberculate.

TYPE LOCALITY: Department of Huehuetenango, Guatemala. Type collected by Seler (no. 2799).

SPECIMENS EXAMINED:

SAN LUIS POTOSÍ: Guascama, Minas de San Rafael, *Purpus* 5256 (N, G, M, F). Río de las Gallinas, *Purpus* 5266 (N, G, M). Limestone ledges, Tamasopo Canyon, *Pringle* 3910 (N, G, M, F, P), 3670 (G).

VERACRUZ: Moist shaded slopes, Barranca de Tenampa, Zucuapan, *Purpus* 2010 (N, G, M. F).

PUEBLA: Río de San Francisco, *Purpus* 3967 (N, G, M, F). Barranca de Tlacuilosto and Cosconati, in the vicinity of San Luis Tultitlanapa, *Purpus* 2560a (N, G, M, F).

OAXACA: Six miles above Dominguillo, alt. 1,500 to 1,800 meters, *Nelson* 1851 (N). Cerro de Teutila, *Conzatti* 3839 (N). Below Coyacatlán, *Smith* 873 (G).

GUATEMALA: Dept. Huehuetenango, *Seler* 2799 (G, Y, type collection).

The bracts of *Scutellaria seleriana* are similar to those of *S. gaumeri*, but in other respects, especially its canescent undulate ovate leaves, this plant is very different from all other described Scutellarias. It is not uncommon for some plants which have lost their stem leaves to develop numerous axillary branches, bearing many small leaves. This gives the plant a very different appearance. The type collection in the New York Botanical Garden is a plant of this kind.

d. **Scutellaria guatemalensis** Leonard, sp. nov.

Stem erect or ascending, simple or occasionally branched, 10 to 30 cm. high, densely and finely grayish-pubescent; petioles 5 to 12 mm. long, densely pubescent; leaf blades ovate to broadly ovate, 1 to 4 cm. long and wide (usually 1 to 4 cm. long and 1 to 3 cm. wide), truncate or shallowly cordate at base, obtusish at apex, coarsely crenate-dentate, grayish-pubescent on both surfaces, the lower surface more densely pubescent and paler than the upper; floral bracts, excepting the leaflike lower ones, lanceolate, their upper surface glabrous or nearly so, the lower pubescent; racemes simple, 3 to 5 cm. long; pedicels 2 to 4 mm. long, pubescent; calyx 1.5 to 2 mm. long at anthesis, becoming 4 mm. long in fruit, pubescent; corolla purple, 1.2 to 1.5 cm long, finely pubescent, the tube gradually enlarging from 1 mm. at base to 2 mm. at throat, the lips equal or the lower slightly longer than the upper, the middle lobe of the upper lip equaling the lateral lobes, notched, strongly undulate, the lower lip ovate, rather prominently 3-lobed, undulate; nutlets unknown.

Type in the U. S. National Herbarium, no. 941626, collected at Santa Rosa, Department of Baja Verapaz, Guatemala, July, 1887, by H. von. Türckheim (J. D. Smith, no. 1196).

ADDITIONAL SPECIMENS EXAMINED:

MEXICO: Chiapas, *Ghiesbreght* 803 (G, M).

GUATEMALA: Santa Rosa, alt. 2,000 meters, *Türckheim* 1196 (N, G). San Miguel Uspantán, *Heyde & Lux* 3123 (N, G).

Large-leaved specimens of *S. seleriana*, when confused with this species, can easily be distinguished by their characteristic orbicular slender-petioled bracts. *S. purpurascens heterophylla* has similarly shaped leaves, but with glabrous under surfaces.

10. Scutellaria costaricana Wendl. Hamb. Gart. Zeit. **19**: 29. 1863.

Tall slender plant; stems erect, simple or sparingly branched (only tips of plants available for study), minutely brown-puberulent; petioles 1.5 to 2.5 cm. long, puberulent; leaf blades elliptic, 8 to 12 cm. long, 4 to 6 cm. wide, more or less panduriform, subcordate at base, attenuate or acute at apex, sinuate-dentate to nearly entire, the veins minutely brown-puberulent, otherwise glabrous; floral bracts minute, linear, 3 to 5 mm. long or the lowermost larger; racemes short, the flowers crowded; pedicels up to 4 mm. long, puberulent; calyx 3 to 4 mm. long, puberulent; corolla red, 4 to 5 cm. long, glabrous or the lower portion slightly pubescent, the tube gradually expanding from 2.5 mm. at base to 8 mm. at throat (slightly constricted below the throat), the upper lip slightly longer than the lower, the lobes short and nearly equal, the lower lip ovate, notched at apex; nutlets not seen.

TYPE LOCALITY: Costa Rica. Type collected by Wendland.

SPECIMENS EXAMINED:

MEXICO: Without data (G).

COSTA RICA: Talamanca, alt. 100 meters, *Tonduz* 9300 (N). Between the Volcán and Convento rivers, *Pittier* 12111 (N). Vicinity of La Palma, on the road to La Hondura, alt. 1,500 to 1,700 meters, *Maxon & Harvey* 7989 (N); *Standley* 36594 (N). Without locality *Kuntze* (Y); *Worthen* in 1910 (M). La Hondura, Prov. San José, alt. 1,300 to 1,700 meters, *Standley* 36579 (N).

This species is well marked by a peculiar inflorescence of long slender crowded vermillion flowers, and by panduriform leaf blades.

11. Scutellaria glabra Leonard, sp. nov.

Tall glabrous plant with simple or branched stems (height unknown but probably reaches 60 cm.); petioles 1.5 to 3 cm. long; leaf blades elliptic-

ovate, 10 to 16 cm. long, 3 to 7 cm. wide, cordate at base (often asymmetric), attenuate at apex, sinuate-dentate or undulate; bracts minute, linear, soon deciduous; racemes 6 to 10 cm. long; pedicels up to 4 mm. long; calyx 3 to 4 mm. long; corolla crimson, 1.5 to 2 cm. long, the tube gradually enlarging from 1 mm. at base to 3 mm. at throat, the lips nearly equal and very short, the lower lip much narrower than the upper, 3-lobed, entire; nutlets 1.5 mm. in diameter, black, tuberculate.

Type in the U. S. National Herbarium, no. 577410, collected at Platanillo, Cañas Gordas Road, Costa Rica, February, 1897, by H. Pittier (no. 11194).

ADDITIONAL SPECIMENS EXAMINED:

COSTA RICA: Finca Navarro, *Maxon* 649 (Y). El Muñeco, south of Navarro, Province of Cartago, alt. 1,400 meters, *Standley* 33692 (N).

Closely related to *S. longifolia*, this plant differs distinctly in its much smaller flowers and glabrous stems and leaves.

12. Scutellaria splendens Link, Klotzsch & Otto, Icon. Pl. Rar. 1: 31. *pl. 13.* 1841.

Perilomia cordifolia Cham. & Schlecht. Linnaea 6: 314. 1831.

Scutellaria scarlatina Planch. & Lind. Hort. Lem. 3: *pl. 104.* 1856.

Stem erect, simple or sparingly branched above, 30 to 40 cm. high, finely pubescent, glandular at least above; petioles slender, 1 to 1.5 cm. long, pubescent; leaf blades ovate to broadly ovate, 1 to 8 cm. long, 3 to 7 cm. wide, rounded or cordate at base, abruptly acutish at apex, irregularly dentate, sparingly pubescent with straight hairs on both surfaces; floral bracts minute, lanceolate, entire, often absent (or the lowermost foliaceous); inflorescence elongate, 15 to 30 cm. long; flowers crowded above, scattered below; pedicels up to 6 mm. long, pubescent with brownish glandular hairs; calyx 3 to 6 mm. long, glandular-pubescent; corolla crimson, 2 cm. long, minutely and sparingly pubescent, the tube gradually enlarging from 1 mm. at base to 4 mm. at throat, the upper lip as long as the lower and much broader, the lobes equal and very short, the middle lobe notched, the lower lip orbicular, entire, scarcely lobed; nutlets unknown.

TYPE LOCALITY: Mexico.

SPECIMENS EXAMINED:

VERACRUZ: Misantla, *Purpus* 5910 (N, G, M, F). Coffee fields, Zacuapan, *Purpus* 1930 (N, G, M, F).

Scutellaria splendens is distinct in its broadly ovate, irregularly dentate leaves with cordate base, and in its elongate racemes.

13. Scutellaria ventenatii Hook. in Curtis's Bot. Mag. **72**: *pl. 4271.* 1846.

Stem erect, simple, or sparingly branched, 30 to 40 cm. high, purple, minutely pubescent, the inflorescence glandular; petioles 1 to 3 cm. long, puberulent; leaf blades ovate, 3 to 5 cm. long, 2 to 4 cm. wide, rounded or cordate at base, obtuse or acutish at apex, crenate, minutely pubescent on both surfaces, the lower surface grayish and paler than the sometimes glabrous upper surface; bracts minute, 2 to 3 mm. long, linear-lanceolate, shorter than the pedicels, or the lower finely serrate and foliaceous; racemes 2 to 4 cm. long at anthesis, becoming 8 to 10 cm. at maturity, the flowers rather numerous; pedicels up to 3 mm. long, pubescent with straight brownish hairs; calyx 2 to 3 mm. long at anthesis, becoming 4 to 5 mm. long in fruit, finely pubescent; corolla 2 cm. long, scarlet, sparsely pubescent, the tube gradually enlarging from 1 mm. at base to 4 mm. at throat, often curved, the upper lip as long as the lower but much broader, the middle lobe notched, the lower lip ovate. entire, obscurely 3-lobed; nutlets tuberculate.

TYPE LOCALITY: Santa Marta Mountains, Colombia.

SPECIMENS EXAMINED:

JAMAICA: Resources, *Harris* 6318 (N, Y). Green Valley, St. Andrew, *Harris* 12387 (M, Y). Vicinity of Troy, *Harris* 8824 (N), 12645 (N, G, M). Ewarton, *Killip* 591. Mandeville, *Britton* 3222 (Y), *Brown* 163 (P), *Crawford* 744 (P). Mount Diabolo, *Maxon & Killip* 485 (N), *Maxon* 2265 (N).

DOMINICA: *Lloyd* 472 (Y).

GUADELOUPE: *Duss* 2150 (Y).

MARTINQUE: *Duss* 1973 (N, Y).

The original description was of a plant grown from seeds found in the mountains of Santa Marta, Colombia, and sent through Purdie to Kew in 1845. Nothwithstanding the fact that all the specimens cited above were collected in the West Indies, they agree in every respect with both the original description and the Colombian specimens in the National Herbarium. In all probability this plant is not native in the West Indies but occurs as an escape from gardens. The herbarium sheets of Harris's no. 6318 and Duss's 1973 bear notes stating that the plants were introduced.

14. Scutellaria ornata Leonard, sp. nov.

Plants densely gray-canescent; stem up to 1 meter long, erect, or at length procumbent with erect branches; petioles 5 to 15 mm. long; leaf blades ovate, 4 to 6 cm. long, 3 to 4 cm. wide (those of the axillary branches smaller), cordate at base, acute or obtusish at apex; bracts minute, soon deciduous; racemes 4 to 10 cm. long, terminating the axillary branches; pedicels up to 4 mm. long, glandular-pubescent; calyx 3 to 4 mm. long, glandular-pubescent; corolla bright red, 1 to 1.2 cm. long, the tube rather abruptly enlarging from 2 mm. below the middle to 4 mm. at throat, the lips equal or the upper slightly longer than the lower, the middle lobe of the upper lip notched, the lower lip ovate, strongly undulate and obscurely 3-lobed; nutlets unknown.

Type in the U. S. National Herbarium, no. 1,139,349, collected in a garden at Puerta de la Laguna, Departamento de la Libertad, El Salvador, April 27, 1922, by Paul C. Standley (no. 23664).

Except for its decumbent habit and densely canescent stems and leaves, *S. ornata* closely resembles *S. ventenatii*, and may be only a form of that well-known species. The origin of the plant here described is unknown.

15. Scutellaria longifolia Benth. in Lindl. Bot. Reg. **18**: under *pl. 1493*. 1832.

Scutellaria isocheila Donn. Smith, Bot. Gaz. **57**: 426. 1914.

Stem erect, simple or sparingly branched above, 30 to 80 cm. high, minutely puberulent, without lens appearing glabrous; petioles slender, 0.5 to 3 cm. long, puberulent; leaf blades thin, ovate to lanceolate, 4 to 10 cm. long, 2 to 4 cm. wide, rounded or narrowed at base, acute at apex, coarsely crenate-serrate, minutely puberulent on the veins, otherwise glabrous; bracts minute, soon deciduous; flowers more or less secund, in elongate racemes; pedicels up to 6 mm. long, puberulent; calyx 3 to 6 mm. long, puberulent; corolla red, 2 to 3 cm. long, pubescent, the tube rather abruptly enlarged from 1.5 mm. below the middle to 4 mm. at throat, the lips nearly equal, the lobes of the upper lip equal and short, the middle lobe notched, the lower lip nearly orbicular, entire; nutlets 2 mm. in diameter, black, tuberculate.

TYPE LOCALITY: Mexico. Type collected by Mociño and Sessé.

SPECIMENS EXAMINED:

MICHOACÁN?: El Porvenir, *Langlassé* 965 (N, G).

GUATEMALA: Volcán Tecuamburro, Dept. Santa Rosa, *Heyde & Lux* 4566 (N, G). Acatepeque, Dept. Zacatepéquez, *Donnell Smith* 2596 (N, G).

San Vicente Tacaya, Dept. Amatitlán, *Tonduz* 479 (N). Without locality, *Heyde* 716 (N). Chama to Cobán, Alta Verapaz, *Johnson* 199 (N).

SALVADOR: Dept. Ahuachapán, *Padilla* 24 (N), 166 (N).

COSTA RICA: Cerro de las Caricias, alt. 1,800 meters, *Pittier* 16128 (N, type of *S. isocheila*). Atirro, Prov. Cartago, *Donnell Smith* 6700 (N, G). Alto de la Estrella, Prov. Cartago, *Standley* 39119 (N), 39134 (N). Viento Fresco, Prov. Alajuela, alt. 1,600 to 1,900 meters, *Standley & Torres* 47823 (N), 47847 (N). Yerba Buena, northeast of San Isidro, Prov. Heredia, alt. 2,000 meters, *Standley & Valerio* 49105 (N), 49712 (N), 49764 (N). Cerros de Zurquí, northeast of San Isidro, Prov. Heredia, alt. 2,000 to 2,400 meters, *Standley & Valerio* 50547 (N). Cerro de las Caricias, north of San Isidro, Prov. Heredia, *Standley & Valerio* 52188 (N).

Scutellaria longifolia is readily distinguished by its brown-puberulent stem, thin, nearly glabrous leaves, and conspicuous red flowers.

Pittier's 16128, the type of *S. isocheila*, differs from other specimens of *S. longifolia* in its smaller leaves.

16. Scutellaria maxonii Leonard, sp. nov.

Stem up to 1 meter long, branched, erect when young, becoming decumbent, finely pubescent with straight spreading hairs; petioles slender, 1 to 2.5 cm. long, pubescent; leaf blades ovate, 3 to 6 cm. long, 2 to 4 cm. wide, rounded at base, acutish at apex, crenate-dentate to undulate, glabrous and dark green above, grayish beneath; bracts minute, soon deciduous; racemes short, 2 to 3 cm. long, few-flowered; pedicels up to 6 mm. long, densely pubescent with straight brownish hairs; calyx 4 to 6 mm. long, glandular-pubescent; corolla bright red, 1.5 to 2 cm. long, pubescent, the tube first rather abruptly, and then gradually, enlarging from 1.5 mm. below the middle to 5 mm. at throat, the upper lip slightly shorter than the lower, the middle lobe shorter than the lateral lobes, the lower lip ovate, entire; nutlets unknown.

Type in the U. S. National Herbarium, No. 675777, collected between the Río Ladrillo and Los Siguas Camp, on the southern slope of Cerro de la Horqueta, Chiriquí, Panama, altitude 1,200 to 1,700 meters, March, 1911, by William R. Maxon (no. 5406).

ADDITIONAL SPECIMEN EXAMINED:

PANAMA: Humid forests of Cuesta de Las Palmas, southern slope of Cerro de la Horqueta, Chiriquí, *Pittier* 3158 (N).

Superficially this species resembles *S. ventenatii*, but it can easily be separated by its more densely pubescent stem, few-flowered racemes, and larger, more pubescent corolla. Furthermore, the upper surface of the leaf blades is glabrous excepting the minutely pubescent, impressed nerves, whereas in *S. ventenatii* the upper surface is evenly but rather sparsely pubescent, and the leaf blades are often cordate (never so in *S. maxonii*).

17. Scutellaria formosa Leonard, sp. nov.

Tall plant (only tips available for study); stems erect or sometimes straggling, simple or sparingly branched, glabrous below, minutely puberulent above; petioles 2 to 4 cm. long, puberulent; leaf blades thin, ovate to oblong-ovate, 6 to 10 cm. long, 4 to 6 cm. wide, rounded at base, gradually narrowed at apex, shallowly crenate, the upper surface glabrous or with a few scattered hairs, the lower surface glabrous except the puberulent veins; bracts minute, soon deciduous; racemes 5 to 15 cm. long; pedicels up to 6 mm. long, puberulent; calyx 3 to 6 mm. long, puberulent; corolla reddish purple, 3 to 4

cm. long, the tube enlarging from 2 mm. below the middle to 9 mm. at throat, strongly curved, the upper lip equaling or shorter than the lower, the lobes short, the middle one notched, the lower lip nearly orbicular, entire; nutlets 1 mm. in diameter, black, granular.

Type in the U. S. National Herbarium, no. 989556, collected on Cerro de la Raya, Cuyamecalco, Distrito de Cincatlán, Oaxaca, Mexico, altitude 2,800 meters, June 24, 1909, by C. Conzatti (no. 2464).

OTHER SPECIMENS EXAMINED:

VERACRUZ: Wet woods, Coatapec, *Barnes & Land* 575 (F).

OAXACA: La Loma, Cuyamecalco, Distrito de Cincatlán, altitude 2,000 meters, *Conzatti* 2496 (N, F), 2465 (N, F).

Except for its puberulent stems and nearly glabrous leaves, this species closely simulates *S. mociniana*. It differs from *S. longifolia* in its much larger flowers and subcordate leaves.

18. Scutellaria mociniana Benth. Labiat. Gen. Sp. 442. 1836.

Perilomia fruticosa Schlecht. & Cham. Linnaea 5: 102. 1830.

Stem erect or sometimes straggling, 30 cm. high or more (only portions of plants available for study), simple or sparingly branched, densely white-pubescent, especially above; petioles 1 to 3 cm. long, pubescent; leaf blades ovate to oblong-lanceolate or elliptic, narrowed or rounded at base, acute at apex, sinuate-dentate or nearly entire, the upper surface sparsely hispidulous, the lower surface minutely pubescent, especially on the veins; bracts oblong-lanceolate, minute, 4 to 5 mm. long; pedicels up to 6 mm. long, puberulent; calyx 3 to 6 mm. long, canescent; corolla red, 3 to 4 cm. long, nearly glabrous, the tube enlarging from 2 mm. below the middle to 7 mm. at throat, the upper lip equaling or shorter than the lower, the lobes short, equal, the middle lobe notched, the lower lip triangular, slightly 3-lobed, crenate toward tip; nutlets unknown.

TYPE LOCALITY: Mexico. Type collected by Mociño and Sessé.

SPECIMENS EXAMINED:

GUATEMALA: Alta Verapaz, *Türckheim* II.2029 (N, G, M, F, P), 1029 (N, G).

This species is well marked by its long red corolla, densely white-pubescent racemes, and hirtellous leaf blades.

19. Scutellaria churchilliana Fernald, Rhodora 4: 138. *pl. 38, f. 1.* 1904.

Stems ascending from a slender rootstock, simple or sparingly branched, 20 to 30 cm. tall, pubescent at least on the angles; petioles 3 to 15 mm. long; leaf blades thin, lance-ovate to oblong-lanceolate or the lowermost ovate, 2 to 5 cm. long, 0.5 to 2 cm. broad, truncate or abruptly narrowed at base, acuminate at apex (the lowermost subcordate at base and rounded at apex), remotely crenate-dentate, glabrous or the veins on the lower surface minutely and sparingly pubescent; bracts ovate-lanceolate, 3 to 19 mm. long, 2 to 5 mm. wide; flowers axillary or in small axillary racemes; pedicels 1 to 2 mm. long, puberulent; calyx 2.5 to 3 mm. long, puberulent; corolla blue, about 1 cm. long, pubescent, the tube enlarged from 2 mm. at base to 3.5 mm. at throat, the lips equal, the middle lobe of each notched, that of the lower lip undulate; nutlets unknown.

TYPE LOCALITY: Thickets by the Aroostook River, Masardis, Maine. Type collected by J. R. Churchill.

SPECIMENS EXAMINED:

QUEBEC: Bic, *Williamson* 1330 (Y).

MAINE: Gravelly river thicket, Bangor, *Fernald & Long* 260 (N, M). Bank of St. Johns River, Fort Kent, *Mackenzie* 3590 (M, Y).

This species is very similar to *S. epilobifolia* in the size and shape of the leaves, but in their thin texture and sparse pubescence it resembles *S. lateriflora*. Plants with small axillary racemes are particularly liable to be confused with *S. lateriflora*. The corolla and pedicels, as well, are intermediate, being at least 5 mm. shorter than those of *S. epilobifolia* and 2 mm. longer than those of *S. lateriflora*. The size of corolla usually furnishes the most satisfactory basis of distinction.

20. Scutellaria lateriflora L. Sp. Pl. **2**: 598. 1753.

Stem simple or branched, erect or ascending, 10 to 80 cm. high, glabrous throughout or sparsely pubescent above, often purplish, stolon-producing at base; petioles slender, 5 to 10 mm. long; leaf blades ovate to ovate-oblong or ovate-lanceolate, 3 to 9 cm. long, 1 to 4 cm. wide, rounded, truncate, or cordate at base, acute or acuminate at apex, coarsely crenate-dentate, or the upper entire, thin, glabrous or very sparsely pubescent; floral bracts lanceolate, equaling or exceeding the calyx; flowers usually numerous, secund, in slender, axillary or terminal racemes; pedicels 1 to 2 mm. long, puberulent; calyx 3 to 4 mm. long, puberulent and sometimes glandular; corolla blue to nearly white, 5 to 8 mm. long, the tube gradually enlarging from 1.5 mm. at base to 3 mm. at throat, the lips nearly equal, the middle lobe of the upper lip slightly notched or entire, the lower lip nearly orbicular and shallowly 3-lobed; nutlets light brown or reddish, strongly tuberculate.

TYPE LOCALITY: "Canada, Virginia."

RANGE: Newfoundland to British Columbia, Florida, New Mexico, and Oregon.

This well-known species is easily recognized by its slender axillary secund racemes and small corollas.

Considerable variation in the color of the corolla is not uncommon. A plant with pink flowers named *S. lateriflora* forma *rhodantha* by Fernald,[9] was collected in an alluvial thicket near the mouth of the Dartsmouth River, Gaspé County, Quebec, August, 1904, by Collins, Fernald, and Pease. A white-flowered plant from Grove Isle, Michigan, was collected August, 1916, and catalogued by Farwell.[10]

21. Scutellaria racemosa Pers. Syn. Pl. **2**: 136. 1807.

Scutellaria rumicifolia H. B. K. Nov. Gen. & Sp. **2**: 324. 1817.

Stem diffusely branched, the branches slender, erect, ascending, or often from a prostrate stem, 10 to 50 cm. high, glabrous; petioles 1 to 5 mm. long; leaf blades ovate to lanceolate, hastate, 5 to 10 mm. long, 3 to 15 mm. wide (the lowermost reniform, the uppermost narrowly lanceolate, averaging 1 to 2 mm. in width), subcordate or narrowed at base, obtuse or rounded at apex, entire, glabrous or the uppermost minutely and sparsely pubescent; flowers very small, numerous; pedicels up to 2 mm. long, puberulent; calyx 2 mm. long, minutely pubescent; corolla blue, 3 to 4 mm. long, minutely pubescent, the tube short, the lips equal in length, the middle lobe of the upper lip notched, scarcely exceeding the lateral lobes, the lower lip nearly orbicular; nutlets less than 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Montevideo, Uruguay.

SPECIMENS EXAMINED:

SAN LUIS POTOSÍ: Grassy hillsides, Las Canoas, *Pringle* 3067 (N, G, M, F).

VERACRUZ: In damp thickets, Huatusco, *Mohr* in 1857 (N). Near Jalapa, *Pringle* 7763 (N, G, M, F). Without definite locality, *Schiede* 105 (N, M). Sierra Madre, between Misantla and Naolinco, *Purpus* 6040 (G).

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[9] Rhodora **23**: 249. 1917.

[10] Rept. Mich. Acad. Sci. **19**: 249. 1917.

JALISCO: Barranca near Guadalajara, *Palmer* 96 (N, P, G).

CHIAPAS: Along banks, Fenix, *Purpus* 468 (F).

Scutellaria racemosa is distinct in its halberd-shaped leaves and minute flowers.

22. Scutellaria nervosa Pursh, Fl. Amer. Sept. 412. 1814.

Scutellaria teucrifolia J. E. Smith in Rees, Cycl. **32**: no. 15. 1816.

Scutellaria gracilis Nutt. Gen. Pl. **2**: 37. 1818.

Scutellaria parviflora Hamilt. in Seringe, Bull. Bot. 300. 1830.

A slender plant with filiform stolons; stems erect or ascending, simple or sometimes branched, 10 to 50 cm. high, glabrous or sparingly pubescent on the angles above; petioles 2 to 3 mm. long or those of the lowermost leaves slender and reaching 10 mm.; leaf blades ovate, 1 to 4 cm. long, 0.5 to 3 cm. wide, narrowed, truncate, or subcordate at base, obtuse at apex, coarsely crenate (the lowermost nearly orbicular to ovate-lanceolate and often entire), the upper surface and veins beneath sparsely pubescent, otherwise glabrous; flowers few, axillary or on small axillary branches; pedicels up to 5 mm. long, minutely pubescent; calyx 3 to 7 mm. long, the nerves pilose; corolla blue, 6 to 8 mm long, pubescent, the upper lip shorter than the lower, the middle lobe of the upper lip notched, the lower lip strongly erose, its lateral lobes prominent; nutlets 1 mm. in diameter, tuberculate, winged.

TYPE LOCALITY: Virginia.

SPECIMENS EXAMINED:

PENNSYLVANIA: Aspinwall, *Twining Herbarium*, June, 1901 (N). Westmoreland County, *Pierron* in 1878 (N, M). Conewago, Lancaster County, *Heller* in 1889 (M).

OHIO: Cincinnati, *Lloyd* in 1882 (N); *Frank* in 1837 (M). North Bend on Ohio River, *Short* (M). Without locality, *Mohr* (N).

ILLINOIS: Woods, Madison County, *Eggert* in 1877 (N, M), in 1893 (M). Athens, *Hall* in 1861 (N, M). Tazewell County, *McDonald* in 1888 (M). Canton, *Wolf* (M). Olney, *Palmer* 15585 (M). Without locality, *Mead* in 1848 (M); *Breuder* in 1873 (N).

MISSOURI: St. Louis, *Eggert* in 1877 (M); *Lindheimer* 1839 (M). Dunklin County, *Bush* in 1892.

MARYLAND: Near Washington, *Ward* in 1879 (N); *Steele* in 1899 (N).

DISTRICT OF COLUMBIA: *Steele* in 1896 (M); *Ward* in 1876 (M). Reform School near Washington, *Ward* in 1884 (N). Insane Asylum, *Coville* in 1889 (N).

VIRGINIA: Dyke, Alexandria County, *Miller* in 1899 (N).

WEST VIRGINIA: Barbour County, *Pollock* in 1897 (M). Upshur County, *Pollock* in 1896 (M).

KENTUCKY: Without locality, *Short* (N). Hancock County, *Palmer* 17803 (M). Bowling Green, *Price* in 1900 (M).

TENNESSEE: Knox County, *Ruth* in 1893 (M). Knoxville, *Ruth* 525 (N); *Scribner* in 1890 (N). Nashville, *Eggert* in 1893 (M). Clarksville, Montgomery County, *Eggert* 17601 (M).

ALABAMA: Etawah County, *Eggert* in 1897 (M).

LOUISIANA: Red River, *Hall* (N).

Notwithstanding its wide range, this species exhibits no great amount of variation. It is well marked by its winged nutlets and large, subsessile, obovate, nearly glabrous, prominently veined leaves.

23. Scutellaria cardiophylla Engelm. & Gray, Bost. Journ. Nat. Hist. **5**: 227. 1845.

Tall annual; stem erect or ascending, branched, 30 to 90 cm. long, puberulent with downwardly curved hairs; petioles slender, 3 to 15 mm. long; leaf blades

ovate to deltoid-ovate, 1 to 3 cm. long, 1 to 2 cm. broad, truncate at base, obtuse or acutish at apex, crenate-serrate, minutely pubescent on both sides or sometimes glabrous above; flowers in leafy racemes; pedicels up to 3 mm. long; calyx 4 to 5 mm. long, minutely pubescent, purplish; corolla blue, 7 to 9 mm. long, minutely pubescent, the tube slender, 1.5 mm. at base, expanding rather abruptly from middle to 5 mm. at throat, the upper lip broader than the lower; nutlets about 1 mm. in diameter.

TYPE LOCALITY: Houston, Texas.

SPECIMENS EXAMINED:

TEXAS: Huntsville, *Tharp* 745 (N). Altair, *Tharp* 2545 (N). Tres Palacios, *Tharp* 2551 (N). Hempstead, *Hall* 454 (N, M). Sandy woods, Dallas, *Reverchon* 770 (N). Sandy soil, Laporte, *Reverchon* 3910 (N, M), 870 (M). Houston, *Fisher* 174 (N), 5173 (N). Waller County, *Thurow* in 1898 (N). Columbus, *Rusby* in 1910 (Y). Walker County, *Warner* (N). Vicinity of Houston, *Dixon* 627 (F). Evergreen Ranch, Galveston Bay, *Joor* in 1884 (M). College Station, Brazos County, *Shaw School of Botany* in 1888 (M). Palestine, Anderson County, *Eggert* in 1899 (M). Jacksonville, Cherokee County, *Palmer* 8606 (M). Augustine, *Palmer* 7887 (M). MacNab, Hempstead County, *Palmer* 10503 (M). Without locality, *Lindheimer* 144 (M).

ARKANSAS: Hot Springs, *Letterman* (M).

This species is unique in being the only strictly annual American *Scutellaria*. The specimens cited are very uniform.

24. Scutellaria coerulea Moc. & Sessé; Benth. in Lindl. Bot. Reg. **18**: *pl. 1493.* 1832.

Scutellaria dumetorum Schlecht. Linnaea **7**: 400. 1832.

Scutellaria distans **Fernald, Proc. Amer. Acad. 35: 562. 1900.**

Roots thickened; stem slender, branching near the base, the branches often numerous, erect, ascending, 10 to 50 cm. high, pubescent in lines with curved hairs; petioles 3 to 5 mm. long; leaf blades ovate to rhombic-ovate, 2 to 5 cm. long, 1 to 4 cm. wide (gradually reduced toward the summit), cuneate or subcordate at base, obtusish at apex, sparingly pubescent with appressed hairs above and on the veins beneath; flowers few, often longer than the upper leaves; pedicels and calyx 3 to 5 mm. long, pubescent with curved hairs; corolla bluish purple, finely pubescent, 2 cm. long, the tube slender, 2 mm. thick at base, gradually expanding to 5 mm. at throat, the upper lip much smaller than the lower, the middle lobe deeply notched, the lower lip prominently 3-lobed, the middle lobe undulate; nutlets 1.5 mm. in diameter.

TYPE LOCALITY: Mexico.

SPECIMENS EXAMINED:

MEXICO: Without locality, *Coulter* 1125 (G).

VERACRUZ: Between San Miguel del Soldado and La Joya, *Schiede* 106 (M, type collection of *S. dumetorum*).

JALISCO: Sierra Madre, west of Bolaños, *Rose* 2951 (N, G, type of *S. distans*).

SAN LUIS POTOSÍ: Alvárez, *Palmer* 133 (N, G, M, F).

HIDALGO: Between Pachuca and Real del Monte, *Rose, Painter & Rose* 8704 (N). Sierra de Pachuca, *Rose & Painter* 6727 (N). Fir forests of Sierra de Pachuca, alt. 3,160 meters, *Pringle* 11102 (N, G, M, F), 7577 (F).

MICHOACÁN: Cool woods, mountains above Pátzcuaro, *Pringle* 4154 (N, G, M, F, P). Morelia, *Arsène* 8475 (N, G, M), 9043 (N, G), 5510 (N, G, M). El Parque, *Orcutt* 4375 (M).

MEXICO: Santa Fe, *Rose & Painter* 8641 (N), 6506 (N); *Bourgeau* 397 (N, G). Hacienda de la Encarnación, *Rose, Painter & Rose* 8464 (N).
MORELOS: El Parque, *Orcutt* 4375 (F).
PUEBLA: Esperanza, *Purpus* 5677 (N).
OAXACA: Sierra de San Felipe, alt. 3,300 meters, *Smith* 428 (N, M); *Nelson* 1958 (N). Cuyamecalco, *Smith* 680 (G).
VERACRUZ: *Ehrenberg* 119 (N).
CHIAPAS: *Ghiesbreght* 87 (G).
GUATEMALA: Above San Rafael, *Lehmann* 1656 (N).

Scutellaria coerulea is characterized by its thickened spindle-shaped roots, elongate inflorescence, floral leaves gradually reduced toward the summit, and the large prominent lower lip of the corolla. *Bourgeau* 397 from Mexico is a tall plant with a simple stem, larger leaves, and longer petioles. Until more material can be studied, these differences hardly seem adequate for describing this plant as a new species. It is probably a robust specimen of *S. coerulea* grown in some unusual environment.

Rose 2951, the type of *S. distans*, differs from normal plants of *S. coerulea* in being more nearly glabrous and in having more pointed leaves.

25. Scutellaria microphylla Moc. & Sessé; Benth. in Lindl. Bot. Reg. 18: *pl. 1493*. 1832.

Stem slender, 10 to 30 cm. high, usually with short branches, pubescent in lines with white curved hairs; petioles slender, up to 10 mm. long; leaf blades ovate to lance-ovate, 1 to 2.5 cm. long, 1 to 1.2 cm. wide, narrowed or truncate at base, obtusish at apex (the lowermost leaves orbicular, cordate at base), crenate, sparsely pubescent on both surfaces or glabrous, the lower surface punctate; pedicels up to 4 mm. long, pubescent; calyx 3 to 4 mm. long at maturity, sparsely pubescent; corolla blue, 10 to 15 mm. long, pubescent, the tube narrow throughout, the lower lip longer than the upper, the middle lobe of the upper lip notched; nutlets about 1 mm. in diameter, granular.

TYPE LOCALITY: Mexico.

SPECIMENS EXAMINED:

VERACRUZ: *Müller* 1736 (Y), 3026 (Y), 3029 (Y); *Botteri* 176 (N, G), 111 (G), 308 (G), 577 (G).

The small slender-petioled leaves, uniform throughout, excepting possibly the lowermost, and the small corollas serve to distinguish this plant from its near relative, *S. coerulea*. A further contrast is conspicuous in the branching of the two plants: The branches of *S. coerulea* arise from near the base and are uniform in length, while those of *S. microphylla*, especially if numerous, are much shorter and smaller than the main stem. In texture of leaves, nature of pubescence, and shape of the corolla the two plants are quite similar.

26. Scutellaria epilobifolia Hamilt. in Seringe, Bull. Bot. 300. 1832.
Scutellaria galericulata of American authors, not *S. galericulata* L. 1753.
Scutellaria pauciflora Pantoc. Oester. Bot. Zeitschr. 23: 266. 1873.
Scutellaria galericulata albiflora Millsp. Fl. W. Va. 428. 1892.
Scutellaria galericulata rosea Rand & Redfield, Fl. Mt. Desert 137. 1894.

A slender plant, perennial by filiform stolons; stems erect or reclining, simple or paniculately branched, 10 to 90 cm. high, glabrate or finely pubescent; petioles up to 3 mm. long; leaf blades oblong-lanceolate to ovate-oblong, 1 to 8.5 cm. long, 0.5 to 3.5 cm. broad, rounded, truncate, or cordate at base, acute at apex, thin, shallowly serrate, finely pubescent on both surfaces or glabrate above (uppermost leaves smaller, sessile, and often entire); flowers axillary; pedicels up to 2 mm. long, puberulent; calyx 3 to 5 mm. long,

minutely pubescent; corolla violet-blue and white, 1.5 to 1.8 cm. long, finely pubescent, the tube 1 to 1.5 mm. at base, enlarging rather abruptly from near middle to 4 or 5 mm. at throat, the upper lip shorter than the lower, the lobes shallowly notched; nutlets 2 mm. in diameter, tuberculate.

TYPE LOCALITY: United States.

RANGE: General throughout northern United States and Canada.

This species had been confused with *S. galericulata* of Linnaeus until Fernald pointed out that the Linnaean plant was exclusively European and has not, up to the present, been collected in the New World. He finds that in the case of the American plant the corolla is 1.5 to 2.5 cm. long, with a whitish or pale tube and thoat, and deep blue galea and lips, while the corolla of the European plant is never more than 1.5 cm. long and uniformly pale blue. In addition to this difference, the leaves of true *S. galericulata* are less pubescent or nearly glabrous, in contrast with the velvety under leaf surface of the American plant. The most important difference, as emphasized by Fernald, exists in the nutlets: In *S. galericulata* they are 1.2 to 1.3 mm. in diameter and sharply muricate, while in the American plant the diameter varies from 1.5 to 2 mm. and the surface is coarsely pebbled or almost warty. As to habit and general appearance the two plants are strikingly similar.

27. Scutellaria alta Jones, Contr. West. Bot. **12**: 70. 1908.

Stems erect, simple or branched, up to 60 cm. tall, from a ligneous base, purplish below, finely pubescent, sparsely pubescent above; petioles slender, 3 to 5 mm. long, the upper narrowly winged; leaf blades triangular-ovate to lance-ovate, 10 to 20 mm. long, 5 to 10 mm. wide, truncate or subcordate at base (the floral leaves narrowed), obtuse at apex, puberulent on both surfaces; flowers few; pedicels up to 5 mm. long, puberulent; calyx 3 to 5 mm. long, puberulent, often becoming glabrous; corolla purplish blue, about 1 cm. long, pubescent, the tube 1 mm. at base, expanding to 7 mm. at throat, the lower lip much larger than the upper, the lobes of both lips prominently notched, the lower lip erose, the upper entire; nutlets 1.5 mm. in diameter, black, granular.

TYPE LOCALITY: Guayanopa Canyon, Sierra Madre, Chihuahua, Mexico. Type collected September, 1903, by Marcus E. Jones.

SPECIMEN EXAMINED:

CHIHUAHUA: Guayanopa Canyon, alt. 2,000 meters, *Jones* in 1903 (N, type collection).

This species has the general appearance and habit of *S. epilobifolia* but differs in its shorter ovate leaves with slender petioles and in its longer corollas.

28. Scutellaria tuberosa Benth. Labiat. Gen. Sp. 441. 1836.

Scutellaria pilosiuscula Nutt.; Benth. in DC. Prodr. **12**: 429. 1848.

Stem from a slender tuber-producing rootstock, erect, sometimes trailing, averaging 10 cm. in height (occasionally up to 30 cm.), pubescent with villous hairs to nearly glabrous; petioles 3 to 10 mm. long; leaf blades thin, ovate, 1 to 5 cm. long, 0.5 to 2.5 cm. wide (usually not over 2 cm. long and 1.5 cm. wide), truncate or narrowed at base, obtuse or rounded at apex, coarsely crenate with a few blunt teeth to nearly entire, sparsely pilose on both surfaces; flowers few; pedicels 2 to 3 mm. long, pilose or puberulent; calyx 3 to 5 mm. long, densely pilose with long hairs; corolla blue, 15 mm. long, the tube 2 mm. at base, expanding from middle to 5 or 6 mm. at throat, the upper lip smaller than the lower, the middle lobe usually notched, the lower lip entire; nutlets black, 1.5 mm. in diameter, strongly muricate.

TYPE LOCALITY: Northern California.

RANGE: Oregon, California, and northern Lower California.

Scutellaria tuberosa is well marked, differing from other tuberous-rooted Scutellarias in its petioled, ovate, coarsely toothed, nearly glabrous leaves, and in the long hairs usually present on the calyx.

29. Scutellaria bushii Britton, Man. 785. 1901.

Roots fibrous; stems several or numerous, tufted, erect or ascending, 15 to 35 cm. high, finely cinereous-puberulent; leaves sessile, rather prominently nerved; leaf blades oblanceolate to oblong-lanceolate, 2 to 3.5 cm. long, 3 to 5 mm. broad (gradually reduced toward the summit), narrowed at base, rounded at apex, entire, minutely but rather sparsely cinereous-pubescent, punctate and resin-dotted; flowers few, in the axils of the upper leaves; pedicels up to 4 mm. long, puberulent; calyx 3 to 4 mm. long, pubescent; corolla blue, minutely pubescent, resin-dotted, the tube gradually dilated from 2 mm. at base to 8 mm. at throat, the lower lip much longer and broader than the upper; nutlets 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Shannon County, Missouri. Type collected by Bush, June, 1890 (no. 54).

SPECIMENS EXAMINED:

MISSOURI: Shannon County, *Bush* in 1888 (N), 49 (M), 48 (M). Monteer County, *Bush* 189 (N, M), 378 (N, M), 7817 (M), 461 (M), 4737 (M). Van Buren, Carter County, *Palmer* 19496 (M).

The strongly punctate leaves, tufted stems, and fibrous roots are characters distinguishing this species from both *S. angustifolia* and *S. antirrhinoides*, to which it bears some resemblance. These characters seem to indicate, however, a closer relationship to the eastern *S. integrifolia multiglandulosa*, as suggested by Penland[11] in his recent treatment of the North American Scutellarias.

30. Scutellaria angustifolia Pursh, Fl. Amer. Sept. 412. 1814.

Scutellaria veronicifolia Rydb. Bull. Torrey Club **36**: 681. 1909.

Rootstocks producing thickened tuberous stolons; stem simple to diffusely branched at base, erect or ascending, minutely puberulent to nearly glabrous, 10 to 30 cm. high; leaves short-petioled or subsessile; leaf blades linear-oblong to oblong-ovate, 1 to 4 cm. long, 5 to 10 mm. broad (upper and lowermost reduced), narrowed or truncate at base, obtuse or rounded at apex, prominently nerved beneath, entire, puberulent to nearly glabrous (the lowermost, if present, ovate-cordate, shallowly serrate); flowers seldom numerous; pedicels 4 to 5 mm. long, puberulent; calyx 3 to 4 mm. long, puberulent, purplish; corolla purplish blue, 2 to 3 cm. long, finely pubescent, the tube very slender, 2 mm. thick at base, expanding rather abruptly from the middle to 10 mm. at the moderately ampliate throat, the lips nearly equal, the middle lobe of upper lip notched, the lower lip erose or undulate; nutlets 1 mm. in diameter, granular.

TYPE LOCALITY: "On the River Kooskoosky."

SPECIMENS EXAMINED:

IDAHO: Hills opposite Lewiston, *Henderson* 2745 (N). Canyon County, *Macbride* 104 (N, M). Coeur d'Alene Mountains, *Leiberg* 1548 (N, M); *Rust* 105 (N); *Aiton* in 1892 (M). Nez Perces County, *Sandberg* 115 (N, M), 8689 (M); *Heller* 3150 (N, M). Without locality, *Austin* 56 (N); *Trelease & Saunders* 4883 (M); *Mulford* in 1892, (M).

WASHINGTON: Whitman County, *Elmer* 900 (N, M), 181 (N). Wenatchee, *Whited* 2616 (N). Spokane, *Kreager* 10 (N); *Savage, Cameron &*

[11] Rhodora **26**: 76. 1924.

Lenocker in 1898 (M). Stevens County, *Eggleston* 13133 (N). Waitsberg, *Horner* 411 (N). Pullman, *Piper* 1570 (N, M). Without locality, *Vasey* in 1883 (N).

OREGON: Horse Creek Canyon, Wallowa County, *Sheldon* 8007 (M, F). Crook County, *Eggleston* 11383 (N), 11381 (N), 12752 (N). Umatilla County, *Eggleston* 12752 (N). West of Fossil, *Lawrence* 438 (N). Dry Creek, *Jardine* 67a (N). Wallowa, *Sampson & Pearson* 80a (N). Near Wimer, Jackson County, *Hammond* 330 (N, M). Grants Pass, *Howell* in 1887 (N). Without locality, *Kellogg & Harford* 742 (N); *Cusick* 2145 (N, M); *Howell* in 1880 (N), in 1877 (M).

CALIFORNIA: Los Angeles County, *Abrams & McGregor* 344 (N). Tulare County, *Culbertson* 4446 (M). Without locality, *Miss Bush* in 1884 (N).

Within the range of its typical form *S. angustifolia* is uniform, but southward in California the species breaks up into several forms and varieties.

The description of *S. veronicifolia* was based on plants collected in Idaho by Sandberg, Macdougal, and Heller (no. 115). The species was described as differing from *S. angustifolia* by its broader corolla tube and usually toothed leaves, but neither of these characters seems sufficiently constant or important to establish a new species.

30a. Scutellaria angustifolia canescens A. Gray in Brewer & Wats. Bot. Calif. 1: 603. 1880.

Scutellaria siphocampyloides Vatke, Bot. Zeit, 30: 717. 1872.

Stem usually branched, pubescent, glandular at least above; leaves oblong-ovate to oblong-elliptic, densely pubescent, glandular; flowers usually erect; pedicels up to 4 mm. long, glandular-pubescent; calyx densely pubescent, often glandular; corolla 10 to 15 mm. long, glandular-pubescent.

TYPE LOCALITY: Western California.

SPECIMENS EXAMINED:

IDAHO: Without locality, *Ainslie* in 1873 (N).

OREGON: Grants Pass, *Howell* in 1884 (N). Troy, Wallowa National Forest, *Jardine* 256 (N).

CALIFORNIA: Dry ridge, Goosenest Mountains, Siskiyou County, *Butler* 1401 (N). Santa Clara County, *Dudley* 4131 (N). Mt. Bullion, *Bolander* 4946 (N, M). Sonora, Tuolumne County, *Eggleston* 9070 (N). Pineridge, Fresno County, *Hall & Chandler* 242 (N, M). Mariposa County, *Hollick* in 1880 (N). Pacheco Pass, Santa Clara County, *Brewer* 1285 (N). Big Sandy Creek, Fresno County, *McDonald* in 1915 (N). Southeastern California, *Purpus* 5605 (N). Cedar Mountains, Alameda County, *Elmer* 4434 (N), Siskiyou County, *Butler* 1401 (N). Long Valley, *Kellogg & Harford* 740 (N, M). Butte County, *Heller* 12814 (N, M), in 1914 (Y). Plumas County, *Austin* (N). Sierra Nevada, *Lemmon* in 1875 (N), 6594 (M). Vicinity of Ione, *Braunton* 1026 (M). Yreka, Siskiyou County, *Greene* in 1876 (M).

This variety is based on its denser glandular pubescence.

30b. Scutellaria angustifolia austinae (Eastw.) Leonard.

Scutellaria austinae Eastw. Bull. Torrey Club 30: 493. 1903.

Scutellaria linearifolia Eastw. Bull. Torrey Club 30: 493. 1903.

Stem simple or branched from the base, sparsely pubescent with curved hairs or glabrous; leaves usually numerous and ascending; leaf blades narrowly oblong-elliptic, minutely puberulent; corolla deep blue, 2 to 2.5 cm. long, sparingly glandular-pubescent, the tube narrow at base and usually

curved so that the flower is in an upright position, the upper lip longer than the lower, the stamens often exserted.

TYPE LOCALITY: Big Chico, Butte County, California. Type collected in May, 1897, by Mrs. C. C. Bruce (no. 1835).

SPECIMENS EXAMINED:

CALIFORNIA: Near Redding, Shasta County, *Heller* 7889 (N, M, Y). Lake County, *Heller* 12386 (N, F). Butte Creek, *Austin* 1835 (N). Plumas County, *Austin* in 1880 (N). Goose Valley, Shasta County, *Eastwood* 1015 (N, M), 1440 (N, M). Nevada City, Nevada County, *Eastwood* 560 (N, M). Frazier Mountains, Ventura County, *Coville & Funston* 1197 (N). Upper Santa Ana, San Bernardino Mountains, *Grinnell* (N); *Crawford* 37 (K); *Parish* 332 (N). Kneeland Prairie, Humboldt County, *Tracy* 3842 (N), 3670 (M). Fox Creek, Plumas County, *Hall & Babcock* 4423 (N). San Jacinto Mountains, *Hall* 334 (N). Musser Hill, Trinity County, *Yates* 353 (N). Dry banks near Yreka, Siskiyou County, *Butler* 939 (N); *Heller* in 1905 (M). Kern County, *Palmer* 146 (N). Sierra Nevada, *Lemmon* in 1875 (N). Bear Valley, San Bernardino County, *Parish* 3122 (N, M), 332 (M), in 1880 (M). Without locality, *Frémont Expedition* in 1845 (N, M); *Parry & Lemmon* 1876 (N, Y, M). Fredalba, San Bernardino Mountains, *Abrams* 2778 (N, M). Weaverville, *Jotter* 323 (N). Pit River Ferry, Shasta County, *Brown* 221 (N, M, F). Big Bear Valley, San Bernardino Mountains, *Harwood* 4318 (N). Bear Creek, Tuolumne County, *Williamson* 24 (N). Idyllwild, San Jacinto Mountains, *Spencer* 2334 (N).

Typically this variety differs from the species in having bright green, oblong-elliptic, erect leaves and an upright corolla with a relatively narrow throat and exserted stamens. The specimens listed show a great amount of variation. In some the leaves are short and approach the ovate-elliptic type characteristic of the species, while others have spreading leaves and corollas, and in many more the stamens are not exserted. In short, there seems to be no distinct line of demarcation between species and variety, especially since many plants possess characters common to both.

The same is true of *S. angustifolia canescens*, except that there exists a closer relationship to the species, as indicated by the more abruptly expanded corolla tube with its broader throat. Except for the glandular pubescence of *S. angustifolia canescens*, the two varieties could be considered identical.

Although the writer has not seen the type of *S. linearifolia*, the description seems to indicate clearly that it is merely a form of *S. angustifolia austinae*.

31. Scutellaria brittonii Porter, Bull. Torrey Club **21**: 177. 1894.

Perennial, from tuberous-thickened rootstocks, the stems simple or branched at base, erect or ascending, finely and minutely pubescent or nearly glabrous, 10 to 25 cm. high; leaves sessile or the lowermost short-petioled; leaf blades ovate-lanceolate to oblong or oval, 10 to 25 mm. long, 3 to 10 mm. broad (the uppermost slightly reduced), narrowed at base, obtuse or rounded at apex, entire or the lowermost shallowly crenulate, prominently veined beneath, pubescent to puberulent on both surfaces or occasionally nearly glabrous; flowers few; pedicels up to 4 mm. long; calyx 4 to 5 mm. long, purplish, pubescent; corolla blue, 1 to 2.5 cm. long, glandular-pubescent, the tube enlarging from 2 mm. at the middle to 8 mm. at the throat, the lips equal, the middle lobe of the upper lip erose; nutlets 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Rocky Mountains of Colorado.

SPECIMENS EXAMINED:

WYOMING: Foothills west of Islay, *Cary* 324 (N). Table Mountain, *Nelson* 94 (N, M). Sand Creek, Albany County, *Nelson* 7009 (N, M).

COLORADO: Fort Collins, *Crandall* 416 (N), 1707 (N), in 1890 (N). Denver, *Wolf* 780 (N); *Smith* in 1891 (M). Clear Creek Canyon, *Coulter* in 1873 (N). Lyons, *Johnson* 162b (N, M). Eastonville, El Paso County, *Eggleston* 11181 (N). Mt. Golden, *Knowlton* 70 (N). Larimer County, *Crandall* in 1890 (N). Ruxton Cross, *Clements* 95 (N, M). Fort Collins, *Crandall* in 1896 (M); *Baker* in 1896 (M). Colorado Springs, *Jones* in 1878 (N). Estes Park, *Johnston* 855 (N). Rocky Mountains, *Patterson* 114a (N). Near Boulder, *Patterson* 296 (M). Gregory Canyon, *Hanson* C211 (M). Eldora, *Payson* in 1919 (M). Jefferson County, *Clokey* 3060 (N, M). Pikes Peak, *Schneck* in 1893 (M). Cañon City, *Brandegee* B413 (M). Evans, Johnston 162a (M), 162b (M). Upper Platte, *Parry* 303 (M). Without locality, *Parry* 431 (N); *Hall* in 1862 (N); *Hall & Harbour* 431 (M).

Scutellaria brittonii is related to *S. angustifolia*, but has broader, more crowded, prominently veined leaves and a coarser, nearly hispidulous pubescence. The specimens cited are uniform except for a variation in the amount of pubescence. *Clements* 95 and *Collins* 1707 from Colorado and *Nelson* 7009 from Wyoming approach *S. brittonii virgulata*.

31a. Scutellaria brittonii virgulata (A. Nels.) Rydb. Fl. Colo. 296. 1906.

Scutellaria virgulata A. Nels. Bull. Torrey Club **25**: 283. 1898.

Stem erect or ascending from a slender rootstock, simple or branched, 20 to 30 cm. high, minutely puberulent; leaf blades oblong-elliptic, 10 to 35 mm. long, narrowed to base, rounded at apex, thin, bright green, sparsely pubescent; pedicels 2 to 3 mm. long, puberulent; calyx 5 to 6 mm. long, pubescent, purplish; corolla 2 cm. long, the tube enlarged from 2.5 mm. at middle to 8 mm. at throat, the lower lip strongly undulate or erose; nutlets not seen.

TYPE LOCALITY: Summits of Laramie Hills, Wyoming. Type collected in June, 1897, by Nelson (no. 3218).

SPECIMENS EXAMINED:

WYOMING: Green Top, *Nelson* 3218 (N, M).

This variety is based on its longer and more slender stem and larger, thin, bright green leaves.

32. Scutellaria hispidula Robinson, Proc. Amer. Acad. **26**: 174. 1891.

Stem slender, 10 to 20 cm. high, erect or ascending from a ligneous base, sparingly hirsute, purplish; leaves small, sessile or the lowermost short-petioled; leaf blades ovate to ovate-elliptic, 5 to 12 mm. long, 5 to 6 mm. broad, entire or undulate, glabrate or sparingly hirsute; flowers few; pedicels up to 2 mm. long, hispidulous; calyx purplish, 3 to 5 mm. long, sparingly covered with white hispidulous hairs; corolla blue, 8 to 10 mm. long, softly pubescent, the tube enlarged from 2 mm. at base to 3 mm. at throat, the upper lip much smaller than the lower, the middle lobe slightly notched, the lower lip as broad as long, with the middle lobe slightly erose; nutlets 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Flor de María, Mexico. Type collected by Pringle in 1890 (no. 3233).

SPECIMENS EXAMINED:

MEXICO: Meadows, Flor de María, *Pringle* 3233 (N, G, M, F, P).

JALISCO: Huejuquilla, *Rose* 2555 (N, G).

MICHOACÁN: Morelia, *Arsène* (N, F).

Scutellaria hispidula is similar in many respects to both *S. resinosa* and *S. drummondii*, but can be separated readily by its sparsely hirsute stems, leaves, and calyx.

33. Scutellaria parvula Michx. Fl. Bor. Amer. **2**: 11. 1803.

Scutellaria parvula mollis A. Gray, Syn. Fl. **2**[1]: 380. 1878.

Scutellaria campestris Britton, Mem. Torrey Club **5**: 283. 1894.

Stem from subterranean moniliform-tuberous stolons, erect or ascending, simple to diffusely branched from base, 10 to 50 cm. high, pubescent throughout with soft spreading hairs, usually glandular, at least above; leaves sessile or the lowermost petiolate; leaf blades ovate to orbicular, 10 to 15 mm. long, 3 to 4 mm. broad, truncate or subcordate at base, obtuse at apex, entire or shallowly toothed, prominently veined beneath, pubescent on both sides (lowermost leaves, if present, reniform, with slender petioles 2 to 15 mm. long, the floral leaves similar to the main stem leaves but reduced); pedicels up to 4 mm. long, densely glandular-pubescent; calyx 2 to 4 mm. long, glandular-pubescent; corolla blue, pilose, 6 to 7 mm. long, the tube short, the lobes of the upper lip nearly equal, the lower lip distinctly 3-lobed; nutlets 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Illinois and Canada.

RANGE: Ontario to Iowa, south to Tennessee, Alabama, Louisiana, and Texas.

Scutellaria parvula is closely related to *S. ambigua*, since both species have similar flowers and roots and resemble each other in habit. There are, however, certain striking differences. The stem of *S. ambigua* is glabrous or, at most, roughened or finely puberulent on the angles, while its leaves are rather narrowly ovate or more nearly lanceolate, strongly involute, and not exceeding 7 mm. in width. The whole plant is more or less purplish and always eglandular. In contrast, *S. parvula* is finely glandular-pubescent and has flat, broadly ovate or oval leaves averaging 10 mm. in width. Furthermore, the lowermost leaves of *S. parvula* are borne on slender petioles 2 cm. long or more, while those of *S. ambigua*, when present, are much reduced, with petioles not exceeding 5 mm. Plants are not uncommon, however, in the ample material of the U. S. National Herbarium, which seem to be intermediate between the two species, but these can always be separated by the difference in character of the pubescence.

34. Scutellaria ambigua Nutt. Gen. Pl. **2**: 37. 1818.

Scutellaria parvula ambigua Fernald, Rhodora **3**: 201. 1901.

Stem erect, from subterranean moniliform-tuberous stolons, simple or diffusely branched, 10 to 20 cm. high, glabrate or minutely puberulent, the angles slightly roughened, especially above; leaves small, all but the lowermost closely sessile; leaf blades ovate to lance-ovate, 5 to 16 mm. long, 3 to 7 mm. broad, truncate or subcordate at base, obtuse at apex, entire or shallowly toothed, strongly revolute, both surfaces glabrous or sparingly puberulent above and with minutely hirsute veins beneath (lowermost leaves, if present, ovate to nearly orbicular, cordate, short-petioled, smaller than the average stem leaves, the floral leaves similar to the stem leaves but smaller); pedicels about 3 mm. long, puberulent; calyx 2 to 4 mm. long, pubescent, especially on the nerves, with curved hairs; corolla blue, minutely pilose, 4 to 8 mm. long, the tube short, the lower lip suborbicular, about 3 mm. broad, the upper lip shorter than the lower, the middle lobe notched; nutlets 1 mm. in diameter, papillose.

TYPE LOCALITY: Council Bluff on the Missouri.

RANGE: Maine to North Dakota, south to Tennessee, Missouri, and Kansas.

Scutellaria ambigua is a well-marked species, readily distinguished from *S. parvula* by its minutely puberulent stem and more pointed leaves with revolute margins.

35. Scutellaria potosina T. S. Brandeg. Univ. Calif. Publ. Bot. 4: 187. 1911.

Stems numerous, from a woody base, simple or branched, erect or ascending, 10 to 20 cm. high, glandular-puberulent; leaves sessile; leaf blades ovate (the uppermost nearly orbicular), 5 to 8 mm. long, 3 to 6 mm. wide, truncate or abruptly narrowed at base, obtuse or rounded at apex, entire, puberulent, bright green; flowers few; pedicels about 2 mm. long, puberulent; calyx 2 to 3 mm. long, glandular-pubescent; corolla blue, 7 to 8 mm. long, finely pubescent, the tube slender, expanding from 2.5 mm. at base to 3.5 mm. at throat, the upper lip smaller than the lower, the lower prominently lobed, erose; nutlets black, 0.5 mm. in diameter, obscurely granular.

TYPE LOCALITY: Minas de San Rafael, San Luis Potosí, Mexico. Type collected in November, 1910, by Purpus (no. 4874).

SPECIMENS EXAMINED:

SAN LUIS POTOSÍ: Minas de San Rafael, *Purpus* 4874 (N, G, M, F, type collection), 5294 (N, G, M, F).

This plant is intermediate between *S. resinosa* and *S. drummondii*, its puberulent stem and leaves suggesting the former and its glandular pubescence the latter. In general appearance it resembles *S. hispidula*, but that is nearly glabrous and not at all glandular.

36. Scutellaria drummondii Benth. Labiat. Gen. Sp. 441. 1836.

Scutellaria helleri Small, Fl. Southeast. U. S. 1024. 1903.

Annual or occasionally perennial; stem erect or ascending, simple or diffusely branched at base, villous-hirsute and mostly glandular; leaves sessile or the lower short-petioled; leaf blades ovate to oblong-ovate or oval, 10 to 15 mm. long, 5 to 10 mm. wide, cuneate at base, obtuse or rounded at apex, entire or crenate-undulate, villous-hirsute, often glandular; pedicels up to 6 mm. long, finely pubescent; calyx 2 to 6 mm. long, villous-pubescent; corolla blue, 10 to 12 mm. long, finely pubescent, the tube expanding from 1.5 mm. near base to 4 mm. at throat, the upper lip smaller, its middle lobe notched, the lobes prominent, the lateral erose; nutlets 1 mm. in diameter, light brown, tuberculate.

TYPE LOCALITY: Texas. Type collected by Drummond.

RANGE: Oklahoma, New Mexico, Texas, and northeastern Mexico.

This species is closely related to *S. resinosa*. It has much the same habit, but differs in its villous glandular pubescence and smaller flowers with the upper lip of the corolla much smaller than the lower. In *S. resinosa* the lips of the corolla are nearly equal.

In his key to the southern species of *Scutellaria*, Small describes *S. drummondii* and *S. cardiophylla* as annuals, and separates them from *S. helleri* and others which he considers perennials. This treatment does not seem entirely satisfactory, especially since the type plants of *S. helleri* possess the roots typical of annuals and in all other ways resemble normal plants of *S. drummondii*. This species in the northern part of its range is invariably annual, but farther south, and especially in Mexico, is plainly perennial, with a characteristic ligneous base as in *S. resinosa*.

37. Scutellaria resinosa Torr. Ann. Lyc. N. Y. 2: 232. 1827.

Scutellaria wrightii A. Gray, Proc. Amer. Acad. 8: 370. 1872.

Stems few to many, 10 to 40 cm. high, from a ligneous base, simple or branched, erect or ascending, cinereous-puberulent; leaves numerous, sessile or subsessile; leaf blades ovate to oblong-spatulate, 5 to 20 mm. long, 3 to 12 mm. wide, narrowed at base, obtuse or rounded at apex, entire, densely and minutely puberulent, resin-dotted; pedicels up to 4 mm. long, puberulent; calyx 3 to 4 mm. long, minutely pubescent; corolla blue, 10 to 15 mm. long, the

tube gradually expanding from 2 mm. at base to 6 mm. at throat, the lips equal, the middle lobe of the upper lip usually notched, the lower lip erose, the lateral lobes prominent; nutlets 1 mm. in diameter, granular.

TYPE LOCALITY: On the Canadian River, Texas.

RANGE: Oklahoma, Texas, Arizona, New Mexico, and northern Mexico.

This species differs from its close ally, *S. drummondii*, chiefly in the puberulent stems and larger flowers.

38. Scutellaria nevadensis Eastw. Bull. Torrey Club **30**: 492. 1903.

Stem branching mostly from the base, purplish, cinereous-pubescent with short curled appressed hairs, 10 to 15 cm. high, from moniliform rootstocks; leaf blades elliptic-ovate, 10 to 25 mm. long, 5 to 15 mm. wide, narrowed to the base, rounded at apex, entire, cinereous-pubescent, slightly coriaceous; pedicels and calyx 3 to 6 mm. long, puberulent; corolla blue, 10 to 20 mm. long, pubescent, the tube narrow, enlarging from 2 mm. at base to 3 mm. at throat, the lips nearly equal, the middle lobe of upper lip rounded, entire, the lower lip slightly broader than long, shallowly 3-lobed; nutlets 1 mm. in diameter, black, tuberculate.

TYPE LOCALITY: Little Lakes Canyon, Western Stampede, Elko County, Nevada. Type collected by Beveridge, July, 1902 (no. 546).

SPECIMENS EXAMINED:

NEVADA: Seven miles east of Ely, *Hitchcock* 1286 (N).

CALIFORNIA: Plumas County, *Austin* in 1877 (F).

The crowded firm erect ovate leaves and short branches give this plant the appearance of *S. nana*.

39. Scutellaria antirrhinoides Benth. in Lindl. Bot. Reg. **18**: *pl. 1493*. 1882.

Scutellaria viarum Heller, Muhlenbergia **1**: 32. 1904.

Stem 10 to 40 cm. high, from uniform thickened rootstocks, erect or ascending, simple or diffusely branched, purplish at least below, puberulent, occasionally glandular; leaves sessile or short-petioled; leaf blades firm, 10 to 20 mm. long, 3 to 12 mm. wide, oblong-ovate to oblong-elliptic (or the lowermost ovate), gradually reduced toward the summit, narrowed at base, obtuse at apex, entire (or the lowermost remotely toothed), puberulent on both surfaces, somewhat canescent; pedicels up to 5 mm. long, puberulent; calyx 3 to 4 mm. long, purplish, puberulent; corolla blue, the throat marked with white, 10 to 15 mm. long, finely pubescent, the tube enlarging from 2 mm. at base to 6 mm. at throat, the lips equal, the lobes entire; nutlets black, 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Banks of the Columbia River near Fort Vancouver, Washington. Type collected by Scouler.

SPECIMENS EXAMINED:

IDAHO: Twilight Gulch, Owyhee County, *Macbride* 480 (N, M). Owyhee Mountains, *Mulford* (M). Silver City, Owyhee County, *Macbride* 739 (N, M), 1689 (N, M). Ketchum, Blaine County, *Nelson & Macbride* 1208 (N, M). Picabo, Blaine County, *Macbride & Payson* 3005 (N, M). Boise, *Nelson* 140 (N, M). Washington County, *Clark* 181 (M). Without locality, *Trelease & Saunders* (M); *Henderson* 3722 (N).

WASHINGTON: Yakima region of the Cascade Mountains, *Brandegee* 14202 (M).

OREGON: Klamath Lake, *Williamson Exped.* (N). Long Lake, Klamath County, *Applegate* 348 (N). Oakland, *Hall* in 1871 (N). Silverton, *Hall* 398 (N, M). North of Corwallis, *Gilbert* 42 (N). Near Westfall, on road to Ontario, *Coville* (N). Juniper Springs, Malheur County, *Leiberg* 2260 (N). Grasshopper Mountain, Lane County, *Coville & Applegate* 1020 (N). Shearers Grade, near Deschutes Canyon,

Lawrence 346 (N). Forest Grove, *Lloyd* in 1894 (Y). Rock Creek Bridge, Upper Klamath, *Peck* 9463 (M). Without locality, *Hall* 742 (M). Grants Pass, Josephine County, *Howell* 1253 (M).

UTAH: Peterson Canyon, *Pammel & Blackwood* 3778 (M).

NEVADA: Dry farm near Blaine, Elko County, *Heller* 11120 (N, M). Ridge above Cave Creek, Elko County, *Heller* 9514 (N). Palisade, *Stokes* in 1903 (N). Parks Station north of Elko, *Hitchcock* 969 (N). Havallah Mountains, *Watson* 834 (N). Palisade, *Jones* 4036 (N, M). Without locality, *Wheeler* in 1872 (N).

CALIFORNIA: West of Winsor, near Russian river, Sonoma County, *Heller* 5786 (N, M, type collection of *S. viarum*). Pitt River, Shasta County, *Smith* 316 (N). Baird, *Smith* 407 (N). North fork of Castle Creek, Siskiyou County, *Smith* 1913 (N). Kneeland Prairie, Humboldt County, *Tracy* 3031 (N, M), 3399 (N). Shasta Springs, Siskiyou County, *Heller* 8020 (N, M). Base of Mount Eddy, Siskiyou County, *Heller* 12111 (N, M), 13270 (N, M). Goose Valley, Shasta County, *Eastwood* 793 (N, M). Head of Butte River, Butte County, *Eggleston* 7308 (N). Prattville, *Jones* in 1879 (N). Mokelumne River, *Hanson* 1808 (N). Near Ukiah, Mendocino County, *Chestnut* 411 (N). Dry ridge, Goosenest foothills, Siskiyou County, *Butler* 1633 (N). Sonoma County, *Bolander* 3947 (N). Sierra Nevada, *Lemmon* in 1875 (N). Hupa Indian Reservation, *Chandler* 1323 (N, M). Mount Shasta, Siskiyou County, *Brown* 384 (N, M); *Palmer* 2461 (N). Siskiyou County, *Butler* 1430 (M), 1690 (M), 1633 (M). Scotts Mountain, *Engelmann* in 1880 (M). Oakgrove, Liebre Mountains, Los Angeles County, *Abrams & McGregor* 344 (N).

Scutellaria antirrhinoides resembles *S. angustifolia* very closely, differing in its shorter and broader corolla tube, and, like its near relative, it is extremely variable. It is impossible to determine with any degree of certainty some of the plants intermediate between these two species.

The type of *S. viarum* is identical in every respect with normal specimens of *S. antirrhinoides*.

39a. Scutellaria antirrhinoides sanhedrensis (Heller) Leonard.

Scutellaria sanhedrensis Heller, Muhlenbergia 1:31. 1904.

Stem from a slender thickened rootstock, simple or branching near base, 10 to 20 cm. high, pubescent, more or less viscid; leaf blades 1 to 2 cm. long, 5 mm. wide or less; corolla 7 to 12 mm. long, the lips equal and entire; nutlets unknown.

TYPE LOCALITY: Summit Lake, Mt. Sanhedren, Lake County, California. Type collected by Heller (no. 5894).

SPECIMENS EXAMINED:

CALIFORNIA: Lake County, *Heller* 5894 (N, M, type collection). Coffee Creek at mouth of Union Creek. Trinity County, *Hall*, 8556 (N). Summit Lake, Lake County, *Hall* 9477 (N). Mountains above headwaters of the Sacramento River, *Pringle* in 1882 (N, M). Southeast side of Snow Mountain above Bonnie View, Lake County, *Heller* 13234 (N, M). Prattville, Plumas County, *Heller & Kennedy* 8798 (N, M, F, Y). Humboldt County, *Tracy* 3399 (M). Near mouth of Little Grizzly Creek below Genesee, Plumas County, *Heller & Kennedy* 8843 (N, M, F, Y).

This variety is based on its smaller size, shorter and narrower leaves, and smaller corolla.

40. Scutellaria saxatilis Ridd. Cat. Ohio Pl. Suppl. 14. 1836.

Scutellaria chamaedryas Shuttl.; Benth. in DC. Prodr. **12**: 422. 1848.

A weak plant, perennial by filiform stolons; stem simple or diffusely branched, ascending or spreading, 10 to 50 cm. high, glabrous or sparingly pilose; petioles slender, 1 to 3 cm. long; leaf blades ovate, ovate-lanceolate, or deltoid, 4 to 5 cm. long, 1 to 3.5 cm. broad (the uppermost lanceolate to oblong-lanceolate, the lowermost nearly orbicular, both much smaller than the main stem leaves), thin, obtuse or rounded at apex, cordate at base, coarsely crenate or crenate-serrate (the uppermost usually entire), pubescent on both surfaces with scattered hairs or glabrous; floral bracts narrowly ovate or lanceolate; flowers mostly few, in simple loose racemes, often secund, or solitary in the axils of the upper leaves; pedicels 2 to 4 mm. long, glandular-pubescent; calyx 2 to 4 mm. long, glandular-pubescent; corolla light blue, 12 to 16 mm. long, nearly glabrous, the tube gradually enlarged from 2 mm. at base to 5 mm. at throat, the upper lip 3-lobed, entire, the lower obscurely 3-lobed, erose; nutlets brown, 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Arid cliffs opposite the mouth of the Scioto, Kentucky.

SPECIMENS EXAMINED:

DELAWARE: Near Wilmington, *Canby* 6619 (M).

PENNSYLVANIA: Jacobs Creek, *Shafer & Medoyas* in 1902 (N, M). Ohiopyle, *Ricker* 1176 (N).

MARYLAND: Along canal above Cabin John, *Leonard & Killip* 689 (N). Near Widewater, below Great Falls, *Maxon* 6335 (N).

DISTRICT OF COLUMBIA: *Vasey* in 1880 (N).

VIRGINIA: Great Falls, *Steele* in 1907 (N). Difficult Run, *Maxon* 6242 (N). Above Potomac Landing, *Ward* in 1878 (N). Without locality, *Hall* in 1828 to 1834 (F).

WEST VIRGINIA: Harpers Ferry, *Pennell* 2423 (N). Near Loudon Heights, *Steele* in 1900 (N), *Palmer* 60 (N). Potts Mountain, *Steele* 31 (N). Quinnimont, *Pollard & Maxon* 41 (N).

NORTH CAROLINA: Without locality, *Parry* in 1870 (N): *Buckley* (M); *Ashe* (M).

TENNESSEE: Rocky ravines, Chilhowee Mountains, *Curtiss* 2054 (N, M). Mountains of the Hiawassee Valley, *Ruth* 528 (N), 545 (M). Without locality, *Ward* in 1878 (N).

OHIO: Steubenville, *Mertz* in 1880 (N).

KENTUCKY: Mudlick Springs, *Short* in 1837 (N).

ARKANSAS: White River, Marion County, *Palmer* 4750 (M).

Although the range of this species is rather extensive, it is usually local and seldom grows in great abundance. The plants are invariably found in rich soil on moist shaded rocky banks.

The specimens listed vary slightly in the amount of pubescence, but otherwise are uniform. Plants with flowers secund in the raceme might possibly be confused with *Scutellaria lateriflora*, but can readily be distinguished by their larger corollas.

40a. Scutellaria saxatilis arguta (Buckl.) Penland, Rhodora **26**: 79. 1924.

Scutellaria arguta Buckl. Amer. Journ. Sci. **45**: 175. 1843.

A weak plant; stem up to 25 cm. high, pilose; leaves 16 to 25 mm. long, 5 to 20 mm. wide, ovate, sharply dentate, sparingly pilose.

TYPE LOCALITY: Black Mountain, North Carolina.

SPECIMENS EXAMINED:

NORTH CAROLINA: Moist bank near base of Mount Mitchell, Yancey County, *Biltmore Herbarium* 7171 (N, M). Vicinity of Montreat, Buncombe County, *Standley & Bollman* 10137 (N).

This variety is established on the pilose stems and more sharply toothed leaves.

41. Scutellaria ovata Hill, Hort. Kew. ed. 1. 242. 1768; ed. 2. 242. *pl.* 8. 1768.
Scutellaria pilosa Hill, Veg. Syst. **13**: 64. 1768.
Scutellaria caroliniana Walt. Fl. Carol. 163. 1788.
Scutellaria cordifolia Muhl. Cat. Pl. 56. 1813.
Scutellaria versicolor Nutt. Gen. Pl. **2**: 38. 1818.
Scutellaria mississipiana Martens, Bull. Acad. Brux. **8**[1]: 66. 1841.

Stem erect, from a slender rootstock, simple or branched, 5 to 90 cm. high, softly pubescent, glandular at least above; petioles 1 to 5 cm. long, pubescent; leaf blades ovate to ovate-oblong, 3 to 12 cm. long, 2 to 8 cm. wide (smaller leaves sometimes present), broadly ovate at base, obtuse or acutish at apex, crenate-dentate, both surfaces varying from densely pubescent to nearly glabrous, the veins very prominent, often reticulate, densely pubescent with straight or sometimes short, retrosely curved hairs; floral bracts ovate or often broadly ovate, usually longer than the pedicels, cordate, subcordate, or narrowed at base, acute or acutish at apex, glandular-pubescent, the lower generally larger and leaflike; flowers numerous, in terminal, simple or panicled racemes; pedicels 2 to 5 mm. long, glandular-pubescent; calyx 3 to 4 mm. long, glandular-pubescent; corolla bright blue, 1 to 2 cm. long, pubescent and slightly glandular, the tube narrow, dilated from 1.5 mm. below the middle to 5 mm. at the throat, the lobes of the upper lip notched, entire, the lower lip deeply notched, slightly longer than broad, undulate; nutlets brown, 1 mm. in diameter, tuberculate.

TYPE LOCALITY: North America.

RANGE: Pennsylvania to Florida, west to Minnesota and Kansas.

The history of the name *Scutellaria ovata*, according to Blake,[12] is, in brief, as follows: Hill described the species in the first edition of Hortus Kewensis, printed in 1768, as *S. ovata* and redescribed it as *S. pilosa* in the thirteenth volume of his Vegetable System, dated 1773, but actually published in 1768, the same year in which the Hortus Kewensis appeared. It was again called *ovata* in the second edition of Hortus Kewensis, published in 1769. The fact that volume 12 of the Vegetable System, published in 1767 (dated 1773), is quoted in the first edition of Hortus Kewensis, while volume 13 is not, would seem to indicate the priority of this edition of the Hortus Kewensis over the thirteenth volume of the Vegetable System. However, since both publications were clearly under preparation at the same time, the wisest choice would be *Scutellaria ovata*.

Scutellaria ovata has long been known as *S. versicolor* Nutt., both the earlier names of *S. ovata* and *S. pilosa*, as well as *S. caroliniana* Walt., having been overlooked.

The large number of specimens examined show great variation in leaf form. The typical plant has large thin leaf blades with the veins on the under surface pubescent with fine white spreading hairs. Other plants have smaller thicker leaves, the rugose veins of which are pubescent with slightly recurved hairs. Since none of these characters are constant in the slightest degree, it does not seem advisable to use them as a basis of segregation.

Small depauperate plants are readily confused with the variety *pilosior;* in fact it is often impossible to find any definite contrasting characters for a basis of separation.

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[12] Rhodora **17**: 134. 1915.

41a. Scutellaria ovata bracteata (Benth.) Blake, Rhodora **17**: 134. 1915.

Scutellaria versicolor bracteata Benth. Labiat. Gen. Sp. 433. 1834.

Scutellaria cordifolia pilosissima Mack. & Bush, Trans. Acad. St. Louis **12**: 84. 1902.

Floral bracts prominent, ovate-cordate, 8 to 20 mm. long, often dark brown on drying.

TYPE LOCALITY: Rio Brazos, Texas.

SPECIMENS EXAMINED:

MISSOURI: Cliff Cave, *Kellogg* (M). Eagle Rock, *Bush* 190 (M, type of *S. cordifolia pilosissima*).

LOUISIANA: New Orleans, *Waite* in 1885 (N). Chopin, Natchitoches Parish, *Palmer* 7966 (M).

TEXAS: Gillespie County, *Jermy* 266 (N). San Antonio, *Havard* in 1884 (N). Shaded ravine, Gutzeit Ranch, San Antonio, *Schulz* 538 (N). Peytons Creek near Bay City, Matagorda County, *Palmer* 9686 (M). Dallas, *Reverchon* 769 (M). Granite Mountains, *Tharp* 1330 (N). Austin, *Tharp* 1766 (N). San Marcos, Hayes County, *Palmer* 12111 (M). Without locality, *Lindheimer* (N, M); *Ward* in 1877 (N).

OKLAHOMA: Caddo, *Sheldon* 47 (N). Between Fort Cobb and Fort Arbuckle on the False Washita, *Palmer* 241 (N).

NUEVO LEÓN: Sierra Madre, *Pringle* 229 (G), 2786 (G).

There appears to be, in the specimens examined, a gradual intergradation from the plants of this variety to those of the species.

41b. Scutellaria ovata pilosior (Benth.) Leonard.

Scutellaria saxatilis pilosior Benth. in DC. Prodr. **12**: 424. 1848.

Scutellaria rugosa Wood, Proc. Amer. Assoc. Sci. 176. 1853.

Scutellaria versicolor minor Chapm. Fl. South. U. S. 323. 1860.

Scutellaria venosa Kearney, Bull. Torrey Club **24**: 571. 1897.

Scutellaria cordifolia minor Mohr, Contr. U. S. Nat. Herb. **6**: 703. 1901.

Plant small; stem simple to diffusely branched; leaf blades usually purplish, 1 to 4 cm. long, 0.5 to 2 cm. wide, the veins on the under surface pubescent with curved hairs; corolla seldom over 1 cm. long.

TYPE LOCALITY: Near Washington, Wilkes County, Georgia.

SPECIMENS EXAMINED:

MISSORRI: Eagle Rock, Barry County, *Bush* 791 (N, M); *Mackenzie* in 1896 (M). Shepherd Mountain near Ironton, *Palmer* 19537 (M). Forsythe, *Trelease* 721 (M). Roaring River, Barry County, *Trelease* 1144 (M).

VIRGINIA: Vicinity of Millboro Springs, Bath County, *Steele* in 1906 (N).

WEST VIRGINIA: Great Bend Tunnel Mountain, Summers County, *Morris* 1021 (N).

TENNESSEE: Cocke County, *Kearney* 873 (N, type of *S. venosa*).

ALABAMA: Coosa Hills, St. Clair County, *Mohr* "B" (N). Auburn, *Earle* in 1896 (N). Sandy woods, Auburn, *Earle* 2056 (N).

Plants of this variety are found in rocky elevated regions. So closely do they resemble *S. saxatilis* in habit and growth that, except for such well-marked characters as the large floral bracts and the fine pubescence of curved hairs on the under surface of the leaf blades, it would be difficult or even impossible to separate the two plants.

Mohr cites with the type of *S. cordifolia minor* Earle's specimen collected at Auburn, Alabama, in 1896, and his own collected at Coosa Hills in St. Clair County, Alabama. Both are mounted on one sheet, the former marked

"A" and the latter "B." The "A" plant resembles his 2056, collected several years later in the same locality, and is to be considered as more typical of the species *ovata* than of the variety *pilosior* on account of its larger size and simple upright stem. The "B" plant of Mohr agrees very well, however, with Chapman's description. Unfortunately the type seems to have been lost, but as it was in Mohr's herbarium when he wrote his Plant Life of Alabama, he evidently examined and compared it with the "B" plant mentioned above.

Scutellaria venosa is based mainly on the short recurved hairs of the veins on its under leaf surfaces, petioles, and, occasionally, the stems. These characters, together with a marked purple coloration, greatly accentuated in the small plants of the type specimen, are usually found in the variety *pilosior* and even occasionally in the species *ovata*.

42. Scutellaria havanensis Jacq. Enum. Pl. Carib. 25. 1762.

Scutellaria cubensis A. Rich. in Sagra, Hist. Cuba Fanerog. 2: 157. 1850.

Scutellaria longiflora Small, Bull. N. Y. Bot. Gard. 3: 437. 1905.

Stem simple or branched, sometimes becoming diffuse, erect, or prostrate with the branches erect or ascending (often elongate), 5 to 20 cm. long, finely and rather densely pubescent with spreading or curved hairs; petioles 1 to 5 mm. long, slender, puberulent; leaf blades ovate, 2 to 10 mm. long, 2 to 10 mm. broad, entire or shallowly crenate, firm, often purplish, finely pubescent on both surfaces with short curved hairs or sometimes nearly glabrous beneath; flowers mostly few in the axils of the upper leaves, forming short or sometimes elongate racemes; floral bracts similar to the leaves but smaller; pedicels 2 to 3 mm. long, puberulent; calyx 2 to 3 mm. long, pubescent with short curved hairs; corolla blue, 12 to 14 mm. long, somewhat tomentose, the tube slender, gradually enlarged from 1.5 mm. at base to 3 mm. at throat, the lips nearly equal, the middle lobe of the upper entire, the lower lip 3-lobed; nutlets about 1 mm. in diameter, reddish brown, shallowly papillose.

TYPE LOCALITY: Havana, Cuba.

RANGE: Peninsular Florida, Veracruz, Bahamas, Cuba, and Hispaniola.

Among the specimens deposited in the National Herbarium, as well as in the ample material of the New York Botanical Garden, there seems to be but little variation in the leaves, pubescence, and flowers. There is a considerable difference represented in habit of growth. The mainland plants, found chiefly in the sandy pine forests of southern Florida, are usually slender, straight, with but few branches, and flower-bearing nearly to the base, while those of the West Indies grow among rocks or on cliffs and are as a rule prostrate and more diffuse, bearing short racemes of flowers near the tips of the branches.

The slender mainland form Small described as *S. longiflora*, while the prostrate island form resembles more closely the type of *S. cubensis* A. Rich., synonymous with *S. havanensis* Jacq. In addition to these, the writer considered for some time the propriety of describing as another species the thin-leaved diffuse Porto Rico plants collected by Sintenis (nos. 5121 and 3102) and Shafer (no. 3325).

While specimens representing the extremes of these three forms, taken by themselves, could well be ranked as distinct species, the contrasting characters, when a large number of plants are examined, break down, leaving not the slightest doubt that these proposed species are conspecific, differing possibly from effects due to environmental factors.

Ervendberg's 242, collected near Tantoyuca, Province of Huasteca, Veracruz, is remarkable, for it is the only occurrence of this species in Mexico noted up to the present time. It resembles the variety *portoricensis*.

42a. Scutellaria havanensis portoricensis Leonard, var. nov.

A small purplish plant; stems several, from a small crown, prostrate and ascending, branched and diffuse, 10 to 15 cm. high, rather sparsely pubescent in lines with white curved hairs; petioles slender, equaling or slightly shorter than the leaf blades, pubescent with small curved hairs; leaf blades thin, ovate, 5 to 12 mm. long, 5 to 10 mm. broad, obtuse or rounded at apex, rounded or subcordate at base, shallowly and coarsely serrrate or the smaller entire, the upper surface sparsely pubescent with curved hairs, the lower surface glabrous except on the sparsely pubescent veins; floral bracts similar in shape to the leaves but much smaller, equaling or exceeding the calyx; flowers few, in short racemes; pedicels 3 to 6 mm. long, puberulent with curved hairs; calyx 2 to 3 mm. long, sparsely puberulent with curved hairs; corolla blue, 10 to 12 mm. long, rather densely pubescent.

Type in the U. S. National Herbarium, no. 792445, collected on the summit of Loma la Mina, Sierra de Naguabo, Porto Rico, altitude 940 meters, July 29, 1914, by J. A. Shafer (no. 3325).

ADDITIONAL SPECIMENS EXAMINED:

PORTO RICO: Summit of Loma la Mina, *Shafer* 3325 (Y); *Sintenis* 5821 (N, M). Coamo, *Sintenis* 3102 (N, G).

This variety is based on its thinner, larger, more nearly glabrous leaves and the lined pubescence of the stems. The latter character suggests a possible relationship to *S. coerulea.*

43. Scutellaria oaxacana Greenm. Field Mus. Bot. 2: 342. 1912.

Scutellaria apiciflora Briq. Ann. Cons. Jard. Genève 17: 396. 1914.

Stem erect or ascending, simple or branched near the base, 10 to 30 cm. high, cinereous-pubescent with short, downwardly curved hairs; petioles short, 2 to 3 mm. long, cinereous-pubescent; leaf blades deltoid-ovate, oval or the upper ovate-lanceolate, 1 to 2.5 cm. long, 0.5 to 1.5 cm. wide, obtuse at apex, truncate or subcordate at base, pubescent above with scattered hairs, glabrous beneath or nearly so excepting the rather sparsely pilose nerves; floral bracts leaf-like, ovate-lanceolate, pilose with curved hairs, exceeding the calyx; flowers comparatively few, somewhat crowded in short terminal racemes 2 to 3 cm. long; pedicels 2 to 3 mm. long, densely puberulent with short straight brownish hairs; calyx 2 to 3 mm. long, pubescent; corolla blue, averaging 13 mm. long, finely pubescent, the tube narrow, the middle lobe of the upper lip notched, the lower lip shallowly notched, erose; nutlets unknown.

TYPE LOCALITY: Oaxaca, Mexico. Type collected by Conzatti (no. 1849).

SPECIMENS EXAMINED:

PUEBLA: San Luis Tultitlanapa, *Purpus* 2561a (N, G, F).

OAXACA: Las Sedas, *Conzatti & González* (G). Rancho Nopalera, alt. 2,000 meters, *Conzatti* 1849 (F).

Scutellaria oaxacana is closely related to both *S. coerulea* and *S. pseudo-coerulea.* It differs from the former in its short crowded inflorescence and from the latter in its much longer bracts.

44. Scutellaria ocmulgee Small, Bull. Torrey Club 25: 142. 1898.

Stem tall, erect, usually branched at the top, 40 to 80 cm. high, densely pubescent with short villous hairs, the inflorescence sometimes slightly glandular; petioles averaging 2 cm.; leaf blades ovate to suborbicular, 3 to 8 cm. long, 3 to 6 cm. wide, obtuse or rounded at apex, cordate (the lower) or truncate (the upper) at base, crenate, pubescent on both surfaces, prominently veined, the veins densely pubescent; floral bracts oblong, oblong-oval, or spatulate, acutish, entire, equaling or nearly equaling the calyx, or some of the lower much larger and resembling stem leaves; flowers rather numerous, in panicled

racemes; pedicels 1 to 3 mm. long; calyx 3 to 5 mm. long, pubescent; corolla bright blue, 2 cm. long, minutely pubescent, the tube gradually dilated from 1.5 mm. at base to 5 mm. at throat, the lower lip suborbicular, 6 to 7 mm. broad, the upper lip slightly longer than the lower, its middle lobe shallowly notched; nutlets unknown.

TYPE LOCALITY: Ocmulgee River Swamp below Macon, Georgia. Type collected by John K. Small, July, 1895.

SPECIMEN EXAMINED:

GEORGIA: Ocmulgee River Swamp below Macon, *Small* in 1895 (Y, type).

This species resembles *S. ovata* in general appearance but differs in its more rounded leaf blades and its eglandular pedicels and calyx.

45. Scutellaria purpurascens Swartz, Prodr. Veg. Ind. Occ. 89. 1788.

Scutellaria felisberti **Nees & Mart. Act. Acad. Caes. Leop. Carol. 11: 77. 1823.**

Stem weak, erect or ascending, simple, or sparingly branched at base, 15 to 20 cm. high, densely puberulent with very short, brown, curved hairs to nearly glabrous; petioles slender 1 to 2 or rarely 5 cm. long; leaf blades thin, deltoid-ovate, 3 to 7 cm. long, 2 to 6 cm. wide, obtuse or rounded at apex, truncate, rounded, or cordate at base, sinuate-crenate, above sparsely pubescent, beneath glabrous or nearly so except the finely puberulent veins; floral bracts very small and narrow or the lowermost leaflike; flowers usually few, in narrow terminal racemes 2 to 6 cm. long; pedicels 3 to 4 mm. long. densely puberulent; calyx 2 to 3 mm. long, sparingly puberulent, the crest much enlarged at maturity; corolla blue or purple, finely but sparingly pubescent, 10 to 15 mm. long, the tube gradually expanding from 1.5 mm. at base to 3.5 mm. at throat, the lips equal, the lobes of the upper entire, the lower erose; nutlets brown, about 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Guadeloupe (*Du Ponthieu*).

SPECIMENS EXAMINED:

COSTA RICA: La Emilia, Llanuras de Santa Clara, *J. D. Smith* 6699 (N, G). Suerre, Santa Clara, *J. D. Smith* 670 (N). Between Limón and María, *Pittier* 16013 (N). Wet thicket, Cerro de la Carpintera, Province of Cartago, alt. 1,500 to 1,850 meters, *Standley* 35491 (N). Thicket, vicinity of San José, alt. 1,150 meters, *Standley* 34822 (N). On brushy slope, Dulce Nombre, Province of Cartago, alt. 1,400 meters, *Standley* 35863 (N). Moist thickets, vicinity of La Verbena, Province of San José, alt. 1,200 meters, *Standley* 32209 (N).

PANAMA: Cana and vicinity, *Williams* 764 (N), 949 (N). Gatún, *Hayes* 59 (Y). Between Frijoles and Monte Lirio, Canal Zone, *Killip* 12162. (N). Sibubi Falls, Sixaola Valley, *Rowlee* 378 (N). Wooded swamp, vicinity of Fort Sherman, Canal Zone, *Standley* 31095 (N).

DOMINICA: *Lloyd* 480 (Y).

MARTINIQUE: *Duss* 1975 (N, Y); *Hahn* 107 (G).

GUADELOUPE: *Duss* 2163 (N, Y), 3474 (Y).

Scutellaria purpurascens is well marked by its narrow, nearly naked racemes and brown pubescence. Smith's 6699 and 6701 from Costa Rica are remarkable for their robust inflorescences, elongate racemes, and large, deeply cordate leaves.

45a. Scutellaria purpurascens heterophylla Benth. in DC. Prodr. **12:** 416. 1848.

Leaf blades ovate to deltoid-ovate, 2 to 4 cm. long, 1.5 to 3 cm. broad, obtusish at apex or the uppermost narrowed to a blunt tip, truncate or subcordate at base; flowers in short, terminal or axillary racemes; corolla blue or bluish purple.

TYPE LOCALITY: Guatemala.

SPECIMENS EXAMINED:

COSTA RICA: Alajuelita, *Tonduz* 8773 (N), 8784 (N). San José, *Tonduz* 1426 (N). Agua Caliente, *Stevens* 221 (N). Vicinity of San José, alt. 1,130 meters, *Standley* 41204 (N). Finca Las Cóncavas, Prov. Cartago, alt. 1,200 to 1,300 meters, *Standley* 41429 (N).

This variety differs in its smaller, more pointed leaves and purplish flowers.

46. Scutellaria pseudo-coerulea Briq. Ann. Cons. Jard. Genève **4**: 240. 1900.

Stem erect, simple or branched, 20 to 40 cm. high, pubescent or puberulent, somewhat cinereous; petioles slender, 1 to 2.5 cm. long, pubescent with short curved hairs; leaf blades deltoid-ovate, the lower often broader than long, 1 to 6 cm. long, 0.5 to 4 cm. wide (the upper and lowermost slightly smaller), obtuse or obtusish at apex, rounded or subcordate at base, crenate-dentate, the upper surface sparingly pubescent with scattered hairs, the lower surface glabrous or nearly so except the veins, these minutely pubescent with straight white hairs; floral bracts small, lanceolate, equaling the pedicels or the lowermost longer; flowers numerous, distant, in terminal racemes 4 to 15 cm. long; pedicels 2 to 4 mm. long, pubescent; calyx 2 to 4 mm. long, pubescent when young, becoming glabrous with age; corolla blue, 15 mm. long, finely pubescent, the tube narrow, gradually enlarged from 1.5 mm. at base to 3 mm. at throat, often curved, the lips equal or the lower longer than the upper, the lateral lobes of the upper lip short, the middle lobe slightly notched, the lobes of the lower lip erose or the sinuses crenulate, the middle lobe notched; nutlets 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Las Canoas, San Luis Potosí, Mexico. Type collected by Pringle (no. 3068).

SPECIMENS EXAMINED:

MEXICO: *Sumichrast* 796 (G).

SAN LUIS POTOSÍ: Damp shaded banks, Las Canoas, *Pringle* 3068 (N, G, M, F).

VERACRUZ: Orizaba, *Mohr Herbarium* 340 (N). *Bourgeau* 2776 (N, G); *Mueller* 1599 (Y); *Seaton* 143 (G, F).

This species, if confused with *S. purpurascens*, can be separated by the straight white pubescence of the veins on the under surface of the leaf blades. It differs from *S. coerulea* in its racemose inflorescence and broad cordate leaves.

47. Scutellaria vitifolia T. S. Brandeg. Univ. Calif. Publ. Bot. **10**: 415. 1924.

Stem from a thickened root, simple or sparingly branched, puberulent, up to 20 cm. high; petioles up to 7 cm. long, puberulent; leaf blades broadly ovate, up to 9 cm. long and 8 cm. wide, cordate at base, acuminate or obtuse at apex, coarsely crenate-serrate, the upper surface sparingly pilose, the lower glabrous except the minutely pilose veins; inflorescence racemose or paniculate, up to 9 cm. long, purplish, pubescent; pedicels 1 to 2 mm. long, becoming 4 mm. long in fruit, puberulent; calyx 3 to 5 mm. long, sparingly and minutely pubescent, becoming glabrous; corolla blue, 8 mm. long, minutely pubescent, the lips about equal, the lateral lobes of the upper lip notched, the middle entire, the lower lip 3-lobed, slightly undulate; nutlets black, tuberculate.

TYPE LOCALITY: Jalisco, Chiapas, Mexico.

SPECIMENS EXAMINED:

CHIAPAS: Jalisco, *Purpus* 9207 (N, C, type).

This very distinct species is easily recognized by its broad ovate leaves and bright purplish-blue flowers. It is similar in many respects to *S. ovata*,

but does not have its characteristic ovate bracts or glandular inflorescence. A similarity in the roots indicates a possible relationship to *S. coerulea.*

48. Scutellaria arenicola Small, Bull. Torrey Club. **25**: 143. 1898.

Stem from a perennial rootstock, erect or ascending, simple or branched, 15 to 30 cm. high; petioles 5 to 20 mm. long, averaging 10 mm., narrowly winged; leaves crowded; leaf blades firm, often purplish, ovate to elliptic, 1.5 to 3 cm. long, 1 to 2 cm. wide, broadly obtuse or rounded at apex and truncate at base (the lower) or obtuse or obtusish at apex and cuneate at base (the upper), serrate or crenate-serrate, rather prominently veined, pubescent on both surfaces with appressed hairs; floral bracts oblong or oblong-lanceolate, equaling or longer than the calyx, entire; flowers in simple panicled racemes; pedicels 2 to 7 mm. long, often glandular; calyx 2 to 7 mm. long, often glandular; corolla blue, 2 to 2.5 cm. long, finely pubescent, the tube gradually dilated from 2 mm. at base to 8 mm. at throat, the lips subequal, the lateral lobes of the upper lip relatively small and short, the lower lip suborbicular, 1 cm. broad, notched, entire; nutlets 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Lake County, Florida.

SPECIMENS EXAMINED:

FLORIDA: Sandy ground, Orlando, Orange County, *Curtis* 6669 (N). Sandy soil, vicinity of Eustis, Lake County, *Nash* 1316 (N, type collection). Flat woods, Fort Myers, *Hitchcock* 277 (N). Jacksonville, Duval County, *Pieters* 39 (N). Mullock Creek District, Lee County, *Jeanette Standley* 440 (N). Rather rare in dry pine barrens, Oneca, *Simpson* 88 (N).

Scutellaria arenicola is a pine-barren plant confined to peninsular Florida. It closely resembles *S. integrifolia major*, a near relative found in low damp places. From this it differs chiefly in its more numerous and thicker leaves, usually longer than the internodes, the upper similar to the lower but reduced. This last character is an especially reliable one for separating the two plants, for at least some of the uppermost leaves of *S. integrifolia major* are always narrowly lanceolate, as in the species *integrifolia.*

49. Scutellaria montana Chapm. Bot. Gaz. **3**: 11. 1878.

Stem slender, simple or sparingly branched, erect from a perennial rootstock, 30 to 50 cm. high, tomentose, glandular; petioles short, narrowly winged, 1 to 2 cm. long; leaf blades ovate to oblong-ovate or lanceolate, 3 to 8 cm. long, 2 to 4 cm. wide, obtuse or acutish at apex, narrowed, truncate, or subcordate at base, coarsely crenate-serrate, sparingly pilose on both surfaces or the veins of the under surface densely pilose; floral bracts similar to the leaves but somewhat narrower, sometimes intergrading with them; flowers few, large, erect, in simple racemes and in the axils of the upper leaves; pedicels 3 to 8 mm. long, glandular-pubescent; calyx 3 to 8 mm. long, glandular-pubescent; corolla blue, 3 to 3.5 cm. long, pubescent to nearly glabrous, the tube gradually enlarged from 2.5 mm. below the base to 5 mm. at throat, the lips nearly equal, the middle lobe of the upper lip notched, much longer than the lateral lobes, the lower lip orbicular, shallowly notched, entire or crenate near the base; nutlets 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Georgia.

SPECIMENS EXAMINED:

MISSOURI: *Pammel* (M).

GEORGIA: *Chapman* (N). Rome, *Chapman Herbarium* (N).

ALABAMA: Stevenson, *Mohr Herbarium* (N).

TENNESSEE: Near Chattanooga, *Churchill* 1911 (M).

Aside from its pubescent stem and leaves this plant is strikingly similar to *S. serrata.*

50. Scutellaria ovalifolia Pers. Syn. Pl. **2**: 136. 1807.

Scutellaria elliptica Muhl. Trans. Amer. Phil. Soc. **3**: 173. 1793, nomen nudum.

Scutellaria pilosa Michx. Fl. Bor. Amer. **2**: 11. 1803. Not *S. pilosa* Hill, 1768.

Scutellaria hirsuta Short, Transylv. Journ. Med. **8**: 582. 1836.

Scutellaria cuneata Willd.; Benth. Linnaea **11**: 345. 1857.

Scutellaria pilosa hirsuta A. Gray, Syn. Fl. **2**[1]: 379. 1878.

A slender perennial; stem simple or branched above, 20 to 70 cm. high, pubescent with soft spreading hairs, more or less glandular above; petioles of the lower leaves 3 cm. long or less, those of the upper leaves much shorter and winged, pubescent with spreading hairs; leaves usually distant, the blades ovate, oval, deltoid-ovate, or oblong-lanceolate, 2 to 7 cm. long, 1.5 to 4 cm. broad, obtuse at apex, truncate to acuminate at base (or the lowermost cordate), crenate or dentate, entire at base, pilose on both surfaces; floral bracts oblong or spatulate, entire, exceeding the calyx, often intergrading into the stem leaves; flowers numerous, in panicles or racemes; pedicels 3 to 4 mm. long, densely pilose, usually glandular; calyx 3 to 4 mm. long, glandular-pilose; corolla blue or pale blue, 12 to 17 mm. long, minutely pubescent, the tube gradually dilated from 1.5 mm. at base to 3 mm. at throat, the upper lip notched and somewhat longer than the crisped notched deltoid-reniform lower lip; nutlets brown, 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Carolina and Georgia.

RANGE: Southern New York and Pennsylvania to Michigan, Florida, and Texas.

This plant, although extremely variable in leaf form and pubescence, can usually be distinguished from other closely related species by its short racemes of crowded, bright blue flowers and its pilose stem, leaves, and calyx.

S. pilosa hirsuta, a poorly defined form, confined to northern Kentucky, is a tall plant with larger, more coarsely toothed leaves and longer pubescence.

51. Scutellaria chalicophila Loesener, Bull. Herb. Boiss. **7**: 569. 1899.

Stem branched at base, the branches simple, 15 cm. high, finely puberulent; petioles 2 to 3 mm. long; leaf blades distant, ovate, 1.8 to 2 cm. long, 0.7 to 1.2 cm. wide, acute or broadly cuneate at base, obtuse or rounded at apex, entire or nearly so, glabrous except the puberulent nerves of the under surface; flowers in short terminal racemes; bracts elliptic-ovate, 3 to 5 mm. long; pedicels about 2 mm. long, puberulent; calyx about 2.5 mm. long, subglabrous or puberulent; corolla blue, about 1.5 cm. long, glandular-pubescent, the tube expanding from 1.5 mm. at base to 3.5 mm. at throat, the lips nearly equal; nutlets not seen.

TYPE LOCALITY: Department of Huehuetenango, Guatemala. Type collected by Seler (no. 2824).

SPECIMEN EXAMINED:

GUATEMALA: On calcareous wooded mountain between Chacula and Uaxackanal, Department of Huehuetenango, alt. 1,400 to 1,500 meters, *Seler* 2824 (G, type collection).

S. chalicophila is closely allied with *S. coerulea*, differing chiefly in its racemose inflorescence and puberulent stems.

52. Scutellaria affinis Leonard, sp. nov.

Roots thickened; stem slender, erect or ascending, simple or branched at base, 10 to 30 cm. high, puberulent or glabrous; petioles 1 to 2 mm. long; leaf blades ovate to rhombic, 1 to 2 cm. long, 0.5 to 2 cm. broad, obtuse at base, shallowly sinuate, the veins on the under surface puberulent, otherwise glabrous or the upper surface sparsely pubescent with minute hairs, often purplish; floral bracts lanceolate, entire, glabrous or puberulent, equaling or slightly

exceeding the calyx; racemes simple, the flowers somewhat crowded; pedicels up to 3 mm. long, puberulent; calyx 2 to 3 mm. long at anthesis (mature calyx not seen), usually purple; corolla blue, 15 mm. long, puberulent, the tube gradually expanding from 2 mm. at base to 4 mm. at throat, the lips equal, the middle lobe of upper lip notched, the lower lip broader than the upper, shallowly three-lobed and notched at apex; nutlets not seen.

Type in the Gray Herbarium, collected in southern Mexico, 1864 to 1870, by Ghiesbreght (no. 802).

ADDITIONAL SPECIMENS EXAMINED:

CHIAPAS (?): *Ghiesbreght* (F, M).

This species is intermediate between *S. coerulea* and *S. pseudo-coerulea.* In its general habit and in shape and size of the leaves it resembles *S. coerulea,* but differs in the glabrous or puberulent stem and leaves and in the racemose inflorescence. The obtuse rhombic-ovate subsessile leaves distinguish it readily from *S. pseudo-coerulea.*

53. Scutellaria gaumeri Leonard, sp. nov.

Hirtellous; stem erect or ascending, 10 to 30 cm. high, branched, tomentose-hirsute; petioles up to 15 mm. long; leaf blades triangular-ovate, 1.5 to 2.5 cm. long, 1.5 to 2.5 cm. wide, truncate at base, obtuse or rounded at apex, crenate; racemes axillary and terminal, up to 12 cm. long; bracts orbicular, slender-petioled, up to 5 mm. in diameter or the lowermost larger and leaflike; pedicels up to 6 cm. long; calyx 1 mm. long, becoming 4 mm. long in fruit; corolla blue, 7 to 8 mm. long, minutely pubescent, the tube gradually enlarging from 1 mm. at base to 2 mm. at throat, the upper lip longer than the lower, its middle lobe notched, the lower lip shallowly 3-lobed, erose; nutlets 1.5 mm. in diameter, brownish, tuberculate.

Type in the herbarium of the Field Museum of Natural History, no. 125961, collected at Pocoboch, Yucatán, Mexico, in 1895 by G. F. Gaumer (no. 2392).

ADDITIONAL SPECIMENS EXAMINED:

YUCATÁN: Chichankanab, *Gaumer* 1435 (F), 1497 (F).

This plant is similar in habit and shape of leaf blades to *S. guatemalensis,* but differs in its coarser hirtellous pubescence and longer purple corolla. In its inflorescence and orbicular slender-petioled bracts there is a close resemblance to *S. seleriana.*

54. Scutellaria serrata Andr. Bot. Rep. 8: 494. 1797.

Scutellaria laevigata Aiken in Eaton, Man. Bot. ed. 6, 333. 1833.

Stem slender, erect, simple or rarely branched, 25 to 70 cm. high, glabrous or sparingly pubescent above; petioles slender, usually 2 cm. long; leaf blades thin, ovate to oval, 3 to 12 cm. long, 2 to 7 cm. broad, narrowed or acute at apex, narrowed or rounded at base, crenate, glabrous on both surfaces or with a few scattered hairs; floral bracts lanceolate, the upper shorter, the lower longer than the calyx; flowers rather few, in a loose terminal raceme; pedicels up to 6 mm. long, puberulent; calyx 4 to 6 mm. long, puberulent, with a purple margin; corolla blue, 2 to 3 cm. long, minutely puberulent, the tube gradually dilated from 3 mm. at base to 10 mm. at throat, curved sharply upward at base, the lips about equal, notched, the upper entire, the lower undulate; nutlets 2 mm. in diameter, tuberculate.

TYPE LOCALITY: Carolina and Florida.

RANGE: Southern New York and Pennsylvania to South Carolina, Illinois, Kentucky, and Tennessee.

This plant is readily recognized by its large, green, nearly glabrous leaves, showy flowers, and glabrous reddish stems.

55. Scutellaria incana Spreng. Mant. Fl. Hal. 44. 1807.

Scutellaria pubescens Muhl. Trans. Amer. Phil. Soc. 3:173. 1793, nomen nudum.

Scutellaria canescens Nutt. Gen. Pl. 2:38. 1818.

Scutellaria villosa Ell. Bot. S. C. & Ga. 2:90. 1824.

Scutellaria serrata Spreng. Syst. Veg. 2:703. 1825. Not *S. serrata* Andr. 1797.

A tall perennial; stem usually branched above, 50 to 120 cm. high, finely pubescent with variously curved hairs, puberulent or sometimes glabrous; petioles slender; leaf blades ovate-oval or oblong-lanceolate, 4 to 12 cm. long, 1.5 to 7 cm. wide, acute or acutish at apex, narrowed or rounded at base (the lowermost sometimes subcordate), crenate-dentate, the upper surface green, glabrous or finely pubescent, the lower surface paler, densely and softly pubescent; floral bracts narrowly lanceolate or linear, more or less pubescent, the upper seldom exceeding the calyx, the lower longer and often intergrading with the stem leaves; flowers numerous, in terminal panicled racemes; pedicels 2 to 3 mm. long; calyx 3 to 5 mm. long, densely pubescent; corolla blue, 2 cm. long, canescent, the tube enlarging from 2.5 mm. at base to 7 mm. at throat, the upper lip larger than the lower, its middle lobe shallowly notched, the lower lip notched, undulate; nutlets black, 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Eastern Pennsylvania.

RANGE: Ontario to Michigan, south to North Carolina, Tennessee, and Missouri.

Notwithstanding the wide range of this species, the specimens examined show but little variation. The plant is very distinct in its canescent calyx, leaf blades (lower surfaces), inflorescence, and stem.

56. Scutellaria punctata (Chapm.) Leonard.

Scutellaria canescens punctata Chapm. Fl. South. U. S. 323. 1860.

Scutellaria incana punctata Mohr, Bull. Torrey Club 24:26. 1897.

A tall perennial; stem erect, usually much branched above, 50 to 120 cm. high, minutely pubescent with short, curved or appressed hairs above, glabrous, sparsely pubescent, or sometimes glandular-puberulent below; petioles 1 to 2 cm. long, sparsely pubescent with appressed hairs or canescent; leaf blades ovate to oblong-ovate or lanceolate, 3 to 12 cm. long, 1 to 6 cm. wide, tapering, truncate, or (the lowermost) cordate at base, acute or acutish at apex, crenate-dentate, glabrous, resin-dotted, the veins sparsely covered with appressed hairs (appearing glabrous without lens); pedicels 2 to 3 mm. long; calyx 2 to 3 mm. long, pubescent; corolla blue and white, 1.5 to 2 cm. long, the tube enlarging from 2 mm. at base to 6 mm. at throat, the upper lip longer than the lower, its middle lobe notched, the lower lip ovate, notched, entire; nutlets black or brownish black, about 1 mm. in diameter, tuberculate.

TYPE LOCALITY: Florida and Georgia.

RANGE: North Carolina to Tennessee and Missouri and southward.

Scutellaria punctata is very closely related to *S. incana*, differing only in the glabrous, punctate, and usually resinous under surface of its leaf blades and its more nearly glabrous stem. It is interesting to note that the northern limit of the range of this species corresponds with the southern limit of the range of its nearest relative. This definite demarcation of range, it would seem, should further justify the maintenance of specific rank for this plant.

A good deal of variation is exhibited in the material examined. This is true chiefly of the plants from Florida, southern Alabama, and Georgia which have smaller, relatively shorter leaf blades and more glandular stems. In other respects, however, these agree with the more typical plants of the northern portion of the range.

57. Scutellaria mellichampii Small, Fl. Southeast. U. S. 1022. 1903.

A tall perennial; stem erect, simple or branched, up to 40 cm. high or more, finely and closely pubescent with short, variously curved hairs; petioles averaging 1 to 3 cm. in length; leaf blades ovate to oval, 3 to 6 cm. long, 2 to 4 cm. broad, blunt at apex, cuneate or truncate at base, crenate, glabrous or nearly so on both surfaces, the veins rather prominent, finely pubescent; floral bracts spatulate, equaling or exceeding the calyx, the lowermost intergrading with the stem leaves; flowers rather numerous and crowded in short paniced racemes; pedicels up to 4 mm. long, hirsute; calyx usually 4 mm. long, strigillose; corolla bluish, 2 cm. long, minutely pubescent, the tube gradually enlarged from 2 mm. at base to 7 mm. at throat, the upper lip much longer than the lower, notched, the lower lip shallowly notched, undulate, entire; nutlets not seen.

TYPE LOCALITY: Near Bluffton, South Carolina.

SPECIMENS EXAMINED:

SOUTH CAROLINA: Beaufort District, *Mellichamp* in 1883 (N, M). Bluffton, *Mellichamp* (M, Y, type).

GEORGIA: Rather dry woods on bank of the Oconee River below Dublin, Laurens County, *Harper* 1368 (N, M, F, Y).

ALABAMA: Tuscaloosa, *Vasey* in 1878 (N). Attalla, Etowah County, *Eggert* in 1897 (N, M); in 1898 (M). Woods, Tuscaloosa, *Mohr* in 1898 (N). Without locality, *Winchell* (N).

S. mellichampii differs from its close relative, *S. puncata*, in having relatively broader leaves, larger corolla, and usually more pubescent stems.

58. Scutellaria altamaha Small, Bull. Torrey Club 25: 143. 1898.

A slender perennial; stem usually simple, erect or ascending, 20 to 30 cm. high, densely canescent with variously curved hairs or tomentose, often purplish; petioles short; leaf blades ovate-oblong, 2 to 5 cm. long, 1 to 2.5 cm. wide, narrowed or truncate at base, acute or acutish at apex, rather finely serrate, glabrate or pubescent with scattered hairs except on the rather densely appressed-pubescent veins, punctate, especially beneath, often resin-dotted; floral bracts equaling or slightly exceeding the calyx or the lowermost intergrading with the stem leaves, oblong-ovate, entire or the larger serrate, punctate, resin-dotted, and pubescent with scattered hairs; flowers numerous and crowded on the short racemes of the narrow panicle; pedicels 1 to 2 mm. long, canescent; calyx 2 to 5 mm. long, rather sparsely pubescent, punctate, resin-dotted; corolla blue, the lower lip marked with white, 1 to 1.3 cm. long, glandular-pubescent, resin-dotted, the tube enlarging from 2 mm. at base to 3 mm. at throat, the upper lip notched, exceeding the lower, the lower lip suborbicular, notched, shallowly 3-lobed, entire or slightly undulate; nutlets not seen.

TYPE LOCALITY: Along the Altamaha River Swamp, Liberty County, Georgia. Type collected by Small in 1895.

SPECIMENS EXAMINED:

GEORGIA: Dry pine barrens two miles west of Dublin, Laurens County, *Harper* 1358 (N, Y). In and about the Altamaha River Swamp, *Small* in 1895 (Y, type).

FLORIDA: In woods, Walton County, *Curtiss* in 1885 (Y).

Scutellaria altamaha resembles *S. punctata* in many ways, but its inflorescence is narrower and more crowded and its corolla much smaller. When confused with *S. ovalifolia* it can easily be separated by its rigid habit, the numerous small branches of the inflorescence with smaller and more crowded flowers, and the eglandular pubescence.

59. Scutellaria glabriuscula Fernald, Bot. Gaz. **33**: 156. 1902.

Slender perennial with a slightly woody base; stem erect, simple or branched, 3 to 7 cm. high, minutely puberulent; leaf blades linear-spatulate to oblong-ovate, gradually narrowed to a slender petiole, acute or acutish at apex, 2 to 6 cm. long. 3 to 10 mm. broad, entire or (the lowermost) obscurely and remotely toothed, glabrous, punctate beneath; floral bracts resembling the leaf blades but smaller; flowers in simple panicled racemes; pedicels 2 to 4 mm. long, puberulent, often bearing scattered glandular hairs; calyx 3 to 5 mm. long, minutely puberulent, at least on the angles and margins; corolla blue with whitish throat, 2.5 cm. long, glabrous, the tube enlarged from 2 mm. at base to 10 mm. at throat, the upper lip slightly longer than the lower, its broad middle lobe notched, the lower lip deeply notched, shallowly 3-lobed, erose or undulate; nutlets not seen.

TYPE LOCALITY: Walton County, Florida.

SPECIMENS EXAMINED:

FLORIDA: Oak thickets on dry sandy land near De Funiak Springs, *Curtiss* 6907 (N, type collection). Sandy pinelands, *Curtiss* 2060 (N). Flat woods, Fort Myers, *Hitchcock* 278 (N). Sanford, Orange County, *Nash* 2277 (N).

Although closely related to *S. integrifolia*, this plant is well characterized by the glabrous corolla and leaves and the minutely puberulent stem.

60. Scutellaria floridana Chapm. Fl. South. U. S. 324. 1860.

A slender perennial; stem simple, erect or ascending, 20 to 50 cm. high, minutely pubescent; leaves sessile, often bearing fasicles of smaller leaves in their axils; leaf blades narrowly linear, 1-nerved, 2 to 3 cm. long, 2 to 3 mm. broad, blunt at apex, entire, glabrous or the veins puberulent, punctate and often resin-dotted; floral bracts similar to the leaf blades but slightly reduced toward the summit; flowers few, large, in simple racemes; pedicels 3 to 4 mm. long, puberulent; calyx 3 to 4 mm. long, glandular-puberulent; corolla blue, 2 cm. long, the tube 3 mm. thick at base, 10 mm. at throat, the lips nearly equal, the middle lobe of the upper lip shallowly notched, the lower lip subovate, deeply notched, entire; nutlets 1.5 mm. in diameter, tuberculate.

TYPE LOCALITY: West Florida.

SPECIMENS EXAMINED:

FLORIDA: Apalachicola, *Chapman* (N). Swamps of the pine barrens, near Apalachicola, *Biltmore Herbarium* 4557a (N).

Related to both *S. integrifolia* and *S. glabriuscula*, this species differs from the former in its strictly linear leaves, and from the latter in its puberulent corolla.

61. Scutellaria brevifolia A. Gray, Syn. Fl. **2**[1]: 380. 1878.

Scutellaria integrifolia brevifolia A. Gray in Hall, Fl. Texas 17. 1873.

A rigid plant from a shrubby base; stems several to numerous, leafy, erect or ascending, simple or branched, 10 to 40 cm. high, gray, puberulent; leaf blades thick, oblong to oblong-ovate or oval, 0.5 to 2 cm. long, 0.3 to 0.7 cm. broad, acutish at apex, rather abruptly narrowed at base, entire, finely puberulent with curved hairs; floral bracts similar to the leaves but slightly reduced toward the summit; flowers in leafy, simple or panicled racemes, often appearing axillary rather than panicled; pedicels 2 to 3 mm. long, cinereous-pubescent; calyx 3 to 4 mm. long, cinereous-puberulent; corolla blue, 1.5 to 2 cm. long, softly pubescent, the tube enlarged rather abruptly from 1.5 mm. below the middle to 7 mm. at the throat, the lips equal or the lower slightly longer than the upper, the lateral lobes of the upper lip nearly as large as the notched middle lobe, the lower lip blunt at apex, 3-lobed, erose to undulate; nutlets granular.

TYPE LOCALITY: Dallas, Texas.

SPECIMENS EXAMINED:

TEXAS: Dallas, *Letterman* 119 (N), 35 (M); dry rocky banks and calcareous soil, *Reverchon* 771 (N, M), 2059 (N, M); dry banks, *Hall* 458 (N, type collection). Common on bluffs, Hutchins, *Reverchon* 2126 (N, M). Texarkana, *Letterman* in 1894 (M).

Scutellaria brevifolia is a distinct species, bearing but little or no resemblance to *S. integrifolia*, as Gray evidently believed it to do when he first described it as a variety of that species. There is, however, some similarity between this species and *S. resinosa*, but the two can always be separated easily by the obovate leaves and smaller, strictly axillary flowers of the latter.

62. Scutellaria integrifolia L. Sp. Pl. 599. 1753.

Scutellaria hyssopifolia L. Sp. Pl. 599. 1753.

Scutellaria caroliniana Lam. Encycl. 7: 706. 1806.

Scutellaria polymorpha Hamilt. in Seringe, Bull. Bot. 306. 1832.

Scutellaria integrifolia hyssopifolia Millsp. Fl. W. Va. 427. 1892.

A slender perennial with fibrous roots; stems one to several, erect, simple or sometimes branched above, 20 to 50 cm. high, minutely pubescent with curved hairs, often glandular above; petioles 2.5 cm. long or less; leaf blades thin, various, the upper linear to oblong or lanceolate, 1.3 to 6.5 cm. long, 0.5 to 1.5 cm. wide, obtuse at apex, narrowed at base, mostly entire, the lower slender-petioled, lanceolate to ovate or nearly orbicular, 1 to 1.5 cm. long, 0.8 to 1.5 cm. wide, obtuse at apex, subcordate or rounded at base, sparingly toothed or the lowermost crenate, puberulent on both surfaces, sometimes punctate and glandular beneath; bracts similar to the upper leaf blades and intergrading with them; flowers few to many, in terminal or panicled racemes; pedicels varying in length, up to 5 mm. long; calyx 4 to 5 mm. long, both calyx and pedicels pubescent and usually glandular; corolla blue or whitish, 2 to 2.5 cm. long, pubescent, the tube enlarged from 2 mm. at base to 7 mm. at throat, the lips subequal, the lateral lobes of the upper lip short, the middle lobe notched, the lower lip triangular-ovate, prominently notched, erose; nutlets about 1 mm. in diameter, gray, deeply papillose.

TYPE LOCALITY: Virginia, Canada.

DISTRIBUTION: Massachusetts to West Virginia, Tennessee, Arkansas, Florida, Louisiana, and Texas.

This species is extremely variable in leaf form. In some plants oblong-lanceolate or linear, entire leaves predominate, while in others ovate toothed leaves extend nearly to the summit. Any degree of variation between these two extremes may easily be found. There is likewise a great degree of variability in leaf texture and in pubescence.

62a. Scutellaria integrifolia major Chapm. Fl. South. U. S. 323. 1887.

Stem 20 to 80 cm. high, usually branching; leaf blades 1 to 7 cm. long, 0.5 to 3 cm. broad, the upper narrowly ovate to oblong-lanceolate, obtuse or acute at apex, narrowed at base, sparsely toothed, the lower ovate, rounded at apex, truncate or cordate at base, slender-petioled, crenate; lower lip of the corolla usually much larger than the upper.

TYPE LOCALITY: Florida.

SPECIMENS EXAMINED:

FLORIDA: Hasting, *Tracy* 9162 (N). Kissimee Prairie, *Mearns* in 1901 (N). Low black soil near Bayou, vicinity of St. Petersburg, *Deam* 4075 (N). Apalachicola, *Vasey* in 1892; *Mohr* in 1892 (N). Low rich places near Jacksonville, *Curtiss* 2060 (N), 5671 (N). Without locality, *Chapman* (N).

ALABAMA: Lookout Mountain, De Kalb County, Mohr in 1892 (N). Baldwin, Point Clear, *Mohr* in 1898 (N). Marion Junction, Dallas County, *Cole* in 1893.

MISSISSIPPI: Ocean Springs, Jackson County, *Pollard* 1343 (N). Biloxi, *Tracy* 4453 (N).

The predominance of toothed leaves marks this variety.

62b. **Scutellaria integrifolia multiglandulosa** Kearney, Bull. Torrey Club. 21: 482. 1894.

Scutellaria multiglandulosa Small, Fl. Southeast. U. S. 1023. 1903.

Stem 15 to 30 cm. high, glandular-pubescent; leaf blades oblanceolate, rounded at apex, narrowed at base, firm, entire, glandular (at least the uppermost), the lowermost ovate and crenate; floral bracts leaflike but reduced in size; pedicels and calyx strongly glandular-pubescent; corolla with broad subequal notched lips, the lower lip strongly erose-undulate.

TYPE LOCALITY: Vicinity of Eustis, Lake County, Florida. Type collected by Nash in 1894 (no. 1126).

SPECIMENS EXAMINED:

GEORGIA: Dry pine barrens, Bulloch County, *Harper* 822 (N).

FLORIDA: Bristol, *Chapman* (N). Apalachicola, *Chapman* (N). Eustis, *Nash* 1126 (N, type). Without locality, *Chapman* (M). Gainesville, *O'Neil* 481 (N).

ALABAMA: Chatta, *Chapman* (N).

This variety is based chiefly on its glandular pubescence.

62c. **Scutellaria integrifolia hispida** Benth. Labiat. Gen. Sp. 435. 1836.

A slender plant up to 70 cm. high; stem usually branching, pilose; leaves thin, pilose.

TYPE LOCALITY: New Orleans, Louisiana. Type collected by Drummond.

SPECIMENS EXAMINED:

FLORIDA: Moist ground near Jacksonville, *Curtiss* 4668 (N). Pine barrens sloping to swamps near Jacksonville, *Curtiss* 6645 (N). Deland, *Marsh* in 1923 (N). Swamp, Duval County, *Fredholm* 51 (N). Pensacola, *Tracy* 8762 (N). Without locality, *Martin* (F).

ALABAMA: Without locality, *Winchell* 171 (N).

LOUISIANA: Pine barrens in the vicinity of Alexandria, *Ball* 517 (N). Vicinity of Covington, *Arsène* 11825 (N); *Anect* 59 (N).

TEXAS: Houston, *Hall* 455 (N); *Rose* 4170 (N). Near Couroe, Montgomery County, *Dixon* 594 (F), 587 (F).

Scutellaria integrifolia hispida, a pine-barren variety, differs from the species in its pilose stems and thinner pilose leaves.

DOUBTFUL SPECIES

SCUTELLARIA DELTOIDEA Raf. Fl. Ludov. 43. 1817.

"*Scutellaria deltoidea* Raf. Caulibus simpliciusculis, pubescentibus; foliis petiolatis, cordato-deltoideis, crenatis, undulatis, tomentosis, subtus canis. Raf. Toque 1. Rob. p. 393. Blossoms in April, has large flowers; stems one or two feet, upright, square, striated, large leaves."

This species is probably synonymous with *S. incana* Spreng.

SCUTELLARIA HASTATA Raf. Fl. Ludov. 44. 1817.

"*Scutellaria hastata* Raf. Pubescens, foliis petiolatis, imis hastatis, dentatis, summis ovalis integris; floralibus axillaribus solitaris, pedunculatis. Raf.

Toque 2. Rob. p. 894. Blossoms in April and May; stem rising only a foot, corolla light violet, lower lip white at the base."

This is probably identical with *S. cardiophylla* Engelm. & Gray.

SCUTELLARIA MULTIFLORA Benth. in Lindl. Bot. Reg. **18**: *pl. 1493*. no. 6. 1832.

"*S. multiflora*, caule erecto tenuiter pubescente, foliis petiolatis ovatis acuminatis obtusè sinuato-dentatis basi rotundato-truncatis; floralibus lanceolato-linearibus, calyce sublongioribus, racemis elongatis simplicibus, floribus secundis, sparsis, corollis calyce villoso quintuplò longioribus.—*Hab.* in Novâ Hispaniâ, Moçino et Sessé (v. s. sp. in Herb. Lambert)."

SCUTELLARIA RADICATA Raf. Atl. Journ. 16. 1832.

"*Scutellaria radicata* Raf., disc. 1818. Root annual, very long; stem small, ramose; leaves on long petioles, ovate, ciliate, obtuse, small, broadly serrate; flowers terminal, axillary, large, pubescent. On river Ohio, three to six inches, differs from *Sc. parviflora* by leaves petiolate and the flowers four times as large."

Aside from the annual root, this description answers very well for *S. saxatilis* Ridd.

SCUTELLARIA VILLOSA Raf. Atl. Journ. 17. 1832.

"*Scutellaria villosa* Raf. disc. 1818. Stem erect, simple, hairy; leaves petiolate, ovate, obtuse, crenate, hairy; raceme bracteate, bracteas obovate, flowers opposite. Indiana and Kentucky, woods; flowers whitish, one foot high, aestival, perennial? differs from *Sc. ovalifolia* by leaves crenate and bracteas."

This is probably synonymous with *S. ovalifolia* Pers.

INDEX

[Synonyms in italic. Page numbers of principal entries in heavy-face type]

	Page
Cassida	703, 704
Galericularia	703
Heteranthesia	704
Lupulinaria	703
Lysimachia galericulata	703
Maschalostachys	704
Perilomia cordifolia	716
fruticosa	719
Scutellaria affinis	741
alta	724
altamaha	744
ambigua	729
angustifolia	725
austinae	726
canescens	726
antirrhinoides	731
californica	713
sanhedrensis	732
apiciflora	737
arenicola	740
arguta	733
aurea	711
conzattii	712
austinae	726
bolanderi	712
californica	713
brevifolia	745
brittonii	727
virgulata	728
bushii	725
californica	713
campestris	729
canescens	743
punctata	743
cardiophylla	721, 730, 748
caroliniana Lam	746
caroliniana Walt	734
chalicophila	741
chamaedryas	733
churchilliana	719
coerulea	722
cordifolia	734
minor	735
pilosissima	735
costaricana	715
cubensis	736
cuneata	741
deltoidea	747
distans	722
drummondii	730
dumetorum	722
elliptica	741
Scutellaria epilobifolia	728
felisberti	738
floridana	745
footeana	712
formosa	718
galericulata	723, 724
albiflora	723
rosea	723
gaumeri	742
glabra	715
glabriuscula	745
gracilis	721
guatemalensis	715
guilielmi	712
hastata	747
havanensis	736
portoricensis	737
helleri	730
hirsuta	741
hispidula	728
hyssopifolia	746
incana	743
punctata	743
integrifolia	746
brevifolia	745
hispida	747
hyssopifolia	746
major	746
multiglandulosa	747
isocheila	718
laevigata	742
lateriflora	720
rhodantha	720
linearifolia	726
longiflora	736
longifolia	717
lutea	710
maxonii	718
mellichampii	744
microphylla	723
mississippiana	734
mociniana	719
montana	740
multiflora	748
multiglandulosa	747
nana	712
nervosa	721
nevadensis	731
oaxacana	737
ocmulgee	737
orichalcea	711
ornata	717

	Page
Scutellaria ovalifolia	741
ovata	734
bracteata	735
pilosior	735
parviflora	721
parvula	729
ambigua	729
mollis	729
pauciflora	723
pedicularis	711
pilosa Hill	734
pilosa Michx	741
hirsuta	741
pilosiuscula	724
polymorpha	746
potosina	730
pseudo-coerulea	739
pubescens	743
punctata	743
purpurascens	738
heterophylla	738
racemosa	720
radicata	748
resinosa	730
rosei	713
rugosa	735
rumicifolia	720
sanhedrensis	732
saxatilis	733
Scutellaria saxatilis arguta	733
pilosior	735
saxicola	714
scarlatina	716
scleriana	714
serrata	742
siphocampyloides	726
spinescens	710
splendens	716
suffrutescens	710
teucrifolia	721
tuberosa	724
venosa	735
ventenatii	716
veronicifolia	725
versicolor	734
bracteata	735
minor	735
viarum	731
villosa Ell	743
villosa Raf	748
virgulata	728
vitifolia	739
wrightii	730
Skullcap	704
Stachymacris	703
Toque, la	704

INDEX

[Page numbers of principal entries in heavy-faced type. Synonyms in italic]

	Page
Abies	275
Acer	375
Aceraceae	375
Achillea	432
Achyrocline crassiceps	596
Acomastylis	363
Acroceras oryzoides	491
Acrolasia	378
Actaea	339
Actinomeris *pachyphylla*	647
Adder's-tongue	311
family	263
Adenocaulon	430
Adenodolichos	663
Adiantum	265
Adscensiones	530
African millet	218
Ageratum albidum	588
corymbosum	588
elassocarpum	588
paleaceum	588
salicifolium	589
annectens	588
Agoseris	415
Agropyron	293
Agrostis	284
flabellata	160
indica	462
radiata	461
rigidifolia	118
virginica	462
Aira	286
laxa	456
Alder	325
Alepidocalyx	663, 672
amblyosepalus	672
anisophyllus	672
parvulus	672
Alisma	279
Alismaceae	279
Alkali blite	332
buttercup	341
Allium	311
Allocarya	79, 461
acanthocarpa	87
ambigens	96
anaglyptica	90
areolata	105
asperula	93, 111
austinae	89
bracteata	93, 113
californica	111
calycosa	101
cervina	100
charaxata	96
chorisiana	103
cognata	107
conjuncta	109
cooperi	105
corrugata	110
cristata	89
cryocarpa	98
cusickii	106
jucunda	106
diffusa	105
dispar	109
distantiflora	91
divaricata	107
divergens	92, 98
eastwoodae	89
echinacea	88
echinoglochin	89
figurata	101
glabra	95
glyptocarpa	90
gracilis	98
granulata	109
greenei	79, 87, 88, 89
hendersoni	113
hickmanii	103
hirta	101
hispidula	99
humistrata	92, 97
hystricula	87
inornata	106
insculpta	109
interrasilis	108
jucunda	106
laxa	98
leibergii	95
leptoclada	93, 93
limicola	97
linifolia	79
lithocarya	79, 102
lonchocarpa	79, 97
media	107
mexicana	79
microcarpa	91
minuta	104
mollis	86
vestita	87
myriantha	103
nelsoni	92, 111
nitens	160
oligochaeta	88
oricola	92

	Page
Allocarya orthocarpa	96
papillata	91
penicillata	99
plebeja	108
pratensis	99
ramosa	100
reticulata	105
salina	95
salsa	106
scalpocarpa	111
scalpta	104
scopulorum	79, 111
scouleri	102
scripta	97
setulosa	93
sigillata	97
spiculifera	90
stipitata	94
micrantha	94, 95
stricta	104
subglochidiata	113
tenera	99
trachycarpa	108
tuberculata	95
undulata	104
vallata	101
vestita	87
wilcoxii	93
Almond family	367
Alnus	325
Alopecurus	283
indicus	210, 222
monspeliensis	179
paniceus	179
Alpine anemone	343
beardtongue	404
bistort	328
dandelion	416
fir	276
firewood	380
forget-me-not	400
goldenrod	422
hawksbeard	418
hawksweed	419
larch	275
lousewort	410
poppy	344
speedwell	407
springbeauty	333
vegetation of Glacier Park	247
Alsike clover	369
Alsine	336
Alsinopsis	337
Altamirania	647
pachyphylla	647
Altamiranoa	647
Althaea	376
Alumroot	355
Amaranthaceae	332
Amaranthus	332
Amarella	394
Ambrosia	430
Amelanchier	366
Ammiaceae	383
Amongeaba	47, 49
Amphiachyris	592

	Page
Amphiachyris dracunculoides	592
Amphipappus	592
dracunculoides	592
fremontii	592
Amphochaeta	211
exaltata	211
Amsinckia	400
Amygdalaceae	367
Anaphalis	429
Anastrophus compressus	472
Anatherum	508
spathiflorum	507
zizanioides	508
Andropogon	506
adustus	510
annulatus	507
bicornis	507
bracteatus	508
contortus	510
hispidus	464
insularis	465
ischaemum	507
latiflorus	510
leucostachyus	508
selloanus	508
muricatus	508
nodosus	507
panormitanus	506
pertusus panormitanus	506
plumosus	510
polydactylon	461
secundus	510
selloanus	508
sorghum sudanensis	509
spathiflorus	507
virgatus	507
Androsace	393
Anemone	343
Angelica	387
Anogra	382
Antennaria	427
Anthaenantia lanata	464
Anthephora hermaphrodita	77
Anticlea	310
Antiphylla	365
Apiaceae	383
Apinus	274
Aplopappus stoloniferus	594
Apocynaceae	395
Apocynum	395
Apple family	366
Aquilegia	340
Arabis	350
Araceae	304
Aragallus	373
Aralia	383
Araliaceae	383
Arbor-vitae	276
Arctic-Alpine Zone in Glacier Park	247
Arctostaphylos	391
Arenaria	337
Argentina	361
Aristida	462, 518
adscensionis	518, 541, 542, 576, 586
aequiramea	556
affinis	571

Page

Aristida *americana* 461, 543, 586
bromoides 543
antillarum 586
appressa 568
brevior 568
arizonica 551, 568, 569
barbata 569
basiramea 533
berlandieri 557
beyrichiana 570
breviglumis 579
brittonorum 584
bromoides 542
californica 521, 522
fugitiva 521
glabrata 522
major 522
capillacea 462, 530, 540
chapadensis 554
chapmaniana 579
chaseae 575
coarctata 542
cognata 561, 576, 577
combsii 582
condensata 581
cumingiana 540
curtifolia 567, 574
curtiseta 556
curtissii 533, 535
curvifolia 559
debilis 543
desmantha 519
dichotoma 530, 533, 534, 535, 536
curtissii 535
dispersa 542, 586
bromoides 542
coarctata 542
humilis 542
nana 542
nigrescens 542
divaricata 547, 548, 551
divergens 525
eggersii 560
elegans 462, 540
elliottiana 571
erecta 570
fasciculata 542
californica 556
fendleriana 561
hookeri 556
micrantha 558
nuttalli 562
fendleriana 561
filipendula 556
flexuosa 526
floridana 524
fuscata 586
geminiflora 529
geniculata 539
geyeriana 571
glabrata 522
glauca 554
gracilis 530, 539
depauperata 539
grisebachiana 543
decolorata 543

Page

Aristida gyrans 581, 583, 584
havardii 546, 551
humboldtiana 547, 548
minor 548
humilis 542
hygrometrica 519
hypomegas 526
implexa 553
aequa 553
intermedia 545
interrupta 585, 586
jacquiniana 547, 548
jonesii 521
jorullensis 528
karwinskiana 551
lanata 530, 565
lanosa 530, 565, 566, 582
lanuginosa 565, 566
leibmanni 573
lemmoni 548
longespica 538, 546, 579
longiramea 551
longiseta 562, 586
hookeri 556
rariflora 565
robusta 564
macrochaeta 536
manzanillioana 528
maritima 543
megapotamica 553
micrantha 558
micropoda 536
mohrii 580
muhlenbergioides 558
nana 542
nealleyi 554
neesiana 582
neglecta 565
nigrescens 542
oligantha 536, 552
nervata 536
orcuttiana 526
orizabensis 568
patiens 517, 586
palmeri 548
palustris 577
pansa 550
paraguayensis 553
parishii 574
patula 550
pauciflora 536
peninsularis 521
perennis 565
portoricensis 575
pseudospadicea 568
pungens 519
purpurascens 571, 579
alabamensis 577
depauperata 579
glaucissima 572
minor 572
purpurea 556, 562, 565
aequiramea 556
berlandieri 556, 557
californica 556
capillarifolia 556

	Page
Aristida purpurea *fendleri*	561
purpurea *fendleriana*	561
hookeri	556
laxiflora	559, 565
longiseta	562
micrantha	558
purpusiana	529
racemosa	571
ramosissima	530, 538
uniaristata	538
recurvata	582
refracta	567, 584, 585
reverchoni	554
angusta	554
augusta	554, 555
riedeliana	582
roemeriana	558
rosei	584
sanctae-luciae	540
scabra	523, 550
schaffneri	543
schiedeana	526
minor	525
scribneriana	566
setifolia	541
simpliciflora	539, 580, 581
simplicifolia	539, 580
texana	539
spadicea	551, 579
spiciformis	552
squarrosa	552
stipoides	519
stricta	529, 543, 552, 565, 570, 571, 580
condensata	582
nealleyi	554
subbiflora	586
subuniflora	561
swartziana	576, 577
tenuispica	581
ternipes	523
divergens	525
tincta	579
torta	579
tuberculosa	520
vaseyi	555
virgata	565, 579
palustris	577
virletii	526
wrightii	559
Arnica	434
Arrowhead	279
Artemisia	432
Arthraterum	519
Arthratherum	518
Section of *Artistida*	519
Arum family	304
Arundinaria	452
deflexa	452
Arundinella	464
brasiliensis	464
hispida	464
Arundo	456
donax	456
nitida	457
roraimensis	457
saccharoides	456
Asclepiadaceae	395
Asclepias	395
Aspen	318
Aspidium	268
Aspilia	619
angusta	619
angustifolia	619
eggersii	619
hirsuta	619
jelskii	619
lanceolata	619
linearifolia	619
linearis	619
macrolepis	617
pachyphylla	647
patentipilis	617
retroflexa	618
tenella	620
triplinervia	620
Aspiliopsis	647
pachyphylla	647
Asplenium	266
Aster	423
family	419
golden	421
Asteraceae	419
Astragalus	370
Atelophragma	371, 372
Atenia	385
Athyrium	266
Atragene	339
Atriplex	330
Avena	287
Avens	363
Axonopus	33, 470
attenuatus	471
aureus	471
capillaris	471
compressus	472
leptostachyus	471
scoparius	471
stragulus	472
Baby's-breath	411
Baccharis alamosana	595
occidentalis	595
potosina	596
Bahama grass	460
Bailey, Vernon	252
Ball, C. R.	253
Balsam fir	275
poplar, western	318
Balsamorrhiza	431
Balsamroot	431
Bamboo, common	453
Bambos vulgaris	453
Bambusa guadua	452
Baneberry	339
Barbados sourgrass	506
Barbarea	348
Barberry family	344
Barley	280
grass	294
Barnyard grass	142
Basketgrass	309
Bastard toadflax	326
Batrachium	341
Bean family	367
Bearberry	391
Beardtongue	404
Beargrass	309

	Page
Bearpaw	309
Beckera *nubica*	211
petiolaris	211
Beckeropsis	210, 211, 212
nubica	211
petiolaris	211
Beckmannia	287
Bedstraw	411
Beeplant, Rocky Mountain	352
Bellis garciae	593
mima	594
purpurascens	594
Bentgrass	284
Berberidaceae	344
Berberis	344
Berchtoldia holciformis	137
oplismenoides	136
Bermuda grass	460
Besseya	407
Betula	324
Betulaceae	324
Bidens *atriplicifolia*	614
Bilderdykia	328
Billion dollar grass	133, 146
Bindweed	396
Birch	324
canoe	325
family	324
scrub	324
water	325
western	325
Bistort	328
Bistorta	328
Bitter dock	329
Bittercress	348
Bittersweet family	375
Black cottonwood	318
hawthorn	366
raspberry	365
twinberry	413
Blackberry, cutleaf	364
Blackfoot Glacier	336
Indians, uses of plants	254
Bladder campion	334
Bladderpod	346
Bladderwort, yellow	410
Blanket-flower	432
Blite, alkali	332
strawberry	332
Blitum	332
Blue beardtongue	405
columbine	340
flag	314
gentian	394
phacelia	398
Bluebells	400
of Scotland	414
Blueberry, Canada	392
family	392
Blue-eyed grass	314
Bluegrass	288
annual	289
Canada	289
Kentucky	289
Bluelips	404
Bluestem, Colorado	293
Bog-asphodel	310
Bog-orchis	316
green	317
two-leaf	317
white	317
Boisduvalia	382
Borage family	399
Boraginaceae	399
Botrychium	263
Bouteloua	461
americana	461, 586
elatior	461
litiosa	461
Bowmania verbascifolia	655
Brachiaria	33, 35
brizantha	35
ciliatissima	35, 38, 39
digitarioides	43
erucaeformis	33, 34, 35, 36, 37
falcifera	35
gilesii	35
meziana	39, 40
miliiformis	35
obtusa	43
ophryodes	37, 38, 39
plantaginea	41, 42
platyphylla	40, 41, 42
prostrata	43
Brachyris	592
dracunculoides	592
angustissima	592
ramosissima	592
Bracken	265
Brassica	348
Brassicaceae	344
Breadroot	333
Brickellia	421
Bristle fern	267
Brittle fern	268
Brome grass	292
Bromus	292
Bronzebells	309
Brooklime, American	407
Brown-eyed Susan	432
Bryanthus	390
Buckbean	395
family	395
Buckthorn	376
family	375
Buckwheat family	326
wild	328
Buffaloberry	378
Bulrush	295
Bunchberry	387
Bupleurum	384
Bur forget-me-not	399
snakeroot	384
Bur-reed	277
family	277
Bursa	346
Bush cinquefoil	360
Butter-and-eggs	404
Buttercup	341
alkali	341
creeping	342
family	338
water	341
Butterfly plant	382

	Page
Butterwort	410
family	410
Cabrera, section of Axonopus	470
Calamagrostis	285
Calea albida	646
brandegei	647
brevipes	647
elegans	627
glomerata	647
hypoleuca	646
insignis	627
leptocephala	646
manicata	647
ovalis	645
pachyphylla	647
pennellii	644
peruviana	644
rupestris	647
sororia	645
tejadae	646
tolimana	645
zacatechichi	646, 647
Callitrichaceae	375
Callitriche	375
Calochortus	313
Calypso	316
Camas	312
death	310
poison	310
Camelina	346
Campanula	414
Campanulaceae	414
Campe	348
Campion, bladder	334
white	334
Canada blueberry	392
bluegrass	289
buffaloberry	378
thistle	438
violet	378
Canadian zone in Glacier Park	241
Canary grass	282
Candytuft, wild	346
Canoe birch	325
Caper family	352
Capim de Angola	135
Capnoides	344
Capparidaceae	352
Caprifoliaceae	412
Capriola	459
dactylon	460
Capsella	346
Caraway	385
Cardamine	348
Carex	296
aenea	300
albo-nigra	303
arcta	301
athrostachya	300
atrosquama	303
aurea	302
bebbii	300
buxbaumii	302
canescens	301
capillaris	302
chalciolepis	303
Carex diandra	300
disperma	301
douglasii	299
festivella	301
filifolia	301
flava	304
geyeri	301
gynocrates	299
halleri	303
hepburnii	299
hoodii	300
interior	300
kelloggii	303
lachenalii	301
laeviculmis	300
lanuginosa	303
lasiocarpa	303
leptalea	301
leptopoda	300
limosa	302
marcida	299
mertensii	303
miliaris	304
nebraskensis	303
nigricans	299
nubicola	301
pachystachya	301
parryana	302
phaeocephala	300
piperi	300
podocarpa	302
praegracilis	299
praticola	300
preslii	301
pyrenaica	299
raynoldsii	302
rossii	302
rostrata	304
sartwellii	300
scirpoidea	302
substricta	303
tolmiei	302
vesicaria	304
viridula	304
Carnation	333
Carpenter-weed	402
Carpet grass	472
Carpet pink	334
vervain	401
Carrot	383
Carum	385
Caryophyllaceae	333
Cascara sagrada	376
Cassida	703, 704
Castilleja	408
Catabrosa	287
Cataterophora	211
Catatherophora	211
hordeiformis	211
Catchfly	334
Catnip	403
Cat-tail	277
family	277
millet	218
Ceanothus	376

Page

Cedar, creeping 277
giant 276
western red 277
Celastraceae 375
Celery 383
Cenchropsis 49
myosuroides 52
Cenchrus 45, 46, 47, 48, 50, 209, 210, 212, 503
aegyptius 77
alopecuroides 52
annularis 54
australis 50
brevisetus 59
capitatus 48, 49
carolinianus 49, 68, 76
catharticus 50, **53**, 54
ciliaris 215
dactylolepis 57, **503**
distichophyllus **54**, 55
echinatus 46, 47, 48, 49, **58**, 59, 62, 63, 503
forma *longispina* 67
var. *brevisetus* 59
var. *tribuloides* 65, 72
var. *viridis* 57
elliottii 52
frutescens 48, 49
gracilis 76
gracillimus **63, 64**, 65, 66, 68, 76
granularis 77
hilarii 77
hirsutus 76
incertus **65**, 76
inflexus 77, 469
insularis **62**, 63
laevigatus 77
macrocarpus 59
macrocephalus 68, 72, 76
marginalis 77, 469
microcephalus 66
multiflorus 59, 77, 219, 220
muricatus 69
mutilatus 77
myosuroides 46, 49, **52**, 59, 212, 234
nervosus 77
niloticus 54
pallidus 55, 56, 59
palmeri 50, **74**, 75, 76
parviflorus 77, 162, 169, 171, 179, 228
pauciflorus 46, 47, 51, 59, 66, **67**, 68, 69, 73
pilosus 50, **55**, 56, 59, 219
pungens 58
racemosus 48, 49, 77
rigidus 57
roseus 67
setoides 52
setosus 77, 220
spicatus 77, 216
spinifex 46, 69
strictus 65
tribuloides 46, 47, 48, 65, 67, 69, **72**, 73, 76
var. *macrocarpus* 72
var. *macrocephalus* 72
tristachyus 77
vaginatus 72
villosus 77, 213
viridis 57, 59, 503
var. *macrocephalus* 57

Page

Cerastium 335
Ceratotropis, section 682
Chaetaria 518, 529
Section of *Aristida* **529**
affinis 571
ascensionis 541
bromoides 542
capillacea 530, 540
capillaris 529, 530, 540
coarctata 542
divaricata 547
fasciculata 542
glauca 554
gossipina 565
humilis 542
interrupta 586
nana 542, 543
olygantha 536
purpurascens 571
recurvata 582
spadicea 551, 579
squarrosa 552
stricta 529, 570
torta 579
tuberculosa 520
Chaetochloa 34, **155**, 156, 209, 282, 501
ambigua **186**
barbata 158, 159
breviseta 179
caudata 198, 199
composita 202, 203, 205
corrugata 171, **191**, 192, 234
parviflora 171, 192
flava 171
geniculata 77, 166, **168**, 169, 171, 172, 192, 228, 234, 502
gibbosa 204
glauca 165, 216, 217
perennis 171
gracilis 171
grisebachii 183, 184
ampla 183
mexicana 183
hispida 192
imberbis 169, 171
geniculata 171
perennis 171
streptobotrys 171
impressa 177
italica 155, **189**, 190, 218, 234
germanica 234
laevigata 171
latifolia 194, 195
breviseta 194
leucopila 205
liebmanni 193
pauciflora 193
longipila 191
lutescens 155, **165**, 167, 216, 217
macrosperma 195, 196, 203
macrostachya 177, **204**, 205, 206, 208
magna 185, 203
occidentalis 171
onurus 177
palmifolia 161, 162, 163
penicillata 171
perennis 171

Page

Chaetochloa poiretiana 159, 160
polystachya 207
purpurascens 171
rariflora 198, 200, 201, 206
rigida 205, 206
salzmanniana 176
scandens 180, 181, 182, 234
scheelei 207, 208
setosa 164, 198, 199, 201, 204, 206
sulcata 160, 162, 163, 164
tenacissima 182
tenax 176, 177, 204, 502
ventenatii 171
versicolor 171
verticillata 178, 179, 186, 234
villosissima 197
viridis 155, 166, 186, 187, 190, 216, 234
vulpiseta 177, 202, 203, 204, 222
Chalice-flower 343
Chamaenerion 380
Chamaepericlimenum 388
Chamaeraphis 50, 156, 209
caudata 199
pauciflora 193
composita 203
corrugata 192
costata 158
crus-ardeae 160
effusa 163
glauca 165, 217
geniculata 170
imberbis 170
laevigata 170
penicillata 170
perennis 170
gracilis 171
imberbis 171
italica 190
ambigua 186
verticillata 178
viridis 187
juergensii 160
jurgensenii 160
macrostachya 205
magna 185
palmifolia 161
paniculifera 163
penicillata 171
setosa 199
caudata 199
macrostachya 204
vulpiseta 203
speciosa 160
sulcata 163
ventenatii 170
verticillata 178
viridis 187
Chamaesyce 374
Chamomilla 432
Charlock 348
Chase, Agnes 253
Cheat 292
Checkerberry 391
Cheilanthes 266
Cheirinia 348
Chenopodiaceae 330

Page

Chenopodium 331
Cherry 367
Chess 292
Chickweed 335
common 336
mouse-ear 335
Chicory family 414
Chimaphila 388
Chloris 460
foliosa 460
polydactyla 461
radiata 461
Chloryllis 663
Chokecherry 367
Choncho 670
Chrysanthemum 432
Chrysopsis 421
Chusquea 452
linearis 452
Cichoriaceae 414
Cicuta 385
Cinna 284
Cinquefoil 359
bush 360
Circaea 379
Cirsium 438
Claytonia 333
Clematis 339
Cleome 352
Clibadium acuminatum 599
anceps 602, 603
appressipilum 600
arboreum 600, 601, 602
caudatum 600
eggersii 597
erosum 600
grande 601
grandifolium 599, 601
leiocarpum 603
micranthum 603
parviceps 598
pentaneuron 598
propinquum 597
pueblanum 601
schulzii 602
sodiroi 597
surinamense 603
sychnocephalum 603
sylvestre 602
trianae 603
vargasii 602
Cliffbrake 265
Clintonia 312
Clover 369
Clubmoss 270
family 270
fir 271
stiff 271
Cochliasanthus, section 677
Coelestina (section of Ageratum) 588, 589
Coeloglossum 317
Cogswellia 386
Coix 513
lacryma-jobi 513
Coleosanthus 421
Collinsia 404
Collomia 397

Colorado bluestem 293
Coltsfoot, sweet 434
Columbine 340
Comandra 326
Comarum 361
Compositae 419
Condylostylis 663, 667
phlebophylla 668
venusta 667
Conringia 348
Convolvulaceae 396
Convolvulus 396
Conyza *stellata* 587
Corallorhiza 315
Coralroot 315
Coreopsis boliviana 644
buchii 641
capillacea 643
longula 642
oblanceolata 642
spectabilis 644
townsendii 643
triloba 643, 644
venusta 643
Corn 280
Cornaceae 387
Cornus 387
Corpse-plant 389
Cortaderia 457
argentea 446
nitida 457
roraimensis 457
Corydalis 344
Cotton 376
Cottongrass 295
Cottonweed 379
Cottonwood, black 318
Cow parsnip 386
Cow-wheat 410
Crabgrass 466
Cranberry, highbush 412
Crane's-bill 374
Crassulaceae 352
Crataegus 366
Creeping cedar 277
spurge 374
wintergreen 391
Crepis 418
Crested shieldfern 264
Cruciferae 347
Cryptantha 113, 400
ambigua 113
muriculata 113
Cryptogramma 265
Cudweed 430
Currant, spiny 357
sticky 357
Curtopogon 518, 530
dichotomus 530, 534
Cyclachaena 430
Cymbopogon 508
bracteatus 508
Cynodon 459
dactylon 460
Cynosurus aegyptius 459
domingensis 459
indicus 459
Cynosurus paniceus 178, 179
virgatus 458
Cyperaceae 294
Cyrtopogon 534
Cystopteris 268
Cytherea 316
Dactyloctenium 459
aegyptiacum 459
aegyptium 77, 459
Daffodil 308
Daisy fleabane 427
ox-eye 432
Dandelion 416
false 415
Danthonia 287
Dasiphora 360
Dasystephana 394
Death camas 310
Deerbrush 376
Delphinium 339
Deschampsia 286
Devil's-club 383
Diazeuxis trinervis 653
Dichanthium nodosum 507
Dichotomae 530
Digitaria (section of Panicum) 34
Digitaria 465
fimbriata 466
horizontalis 466
longiflora 468
marginata 466
sanguinalis 466
setigera 466
setosa 466
Dill 383
Dioclea trinervia 664
Diplotaxis 347
Disporum 313
Distegia 413
Distichlis 288
Divaricatae 530
Dock 329
bitter 329
golden 329
mountain 330
pale 329
sour 330
yellow 329
Dodecatheon 393
Dogbane 395
family 395
Dog-tooth violet 311
Dogtown grass 517, 563
Dogwood family 387
flowering 388
red-osier 387
Dolichopsis 663, 665
Dolichos 663
Dondia 331
Double bladderpod 346
Douglas fir 276
spruce 276
Draba 349
Dragonhead 402
Drosera 352
Droseraceae 352

	Page
Dryad	362
Dryas	362
Drymocallis	362
Dryopteris	267
Duckwood	304
Dulichium	295
Dyslobium	663
Dyssodia	650
hartwegii	650
wootoni	**650**
Echinaria	49
capitata	47, 48
Echinochloa	1, 34, 123, **133**, 501
colonum	133, **150**, 151, 501
zonalis	151
composita	148
crusgalli	133, **139**, 140, 141, 142, 234
aristata	140
crus-pavonis	**148**, 149
edulis	133, **146**
frumentacea	146
mitis	142, **144**, 145, 147
zelayensis	144, **147**
cubensis	129
erucaeformis	36
frumentacea	146
holciformis	**137**
longiaristata	138
muricata	140
oplismenoides	**136**
polystachya	**135**, 501
pyramidalis	**134**
sabulicola	149
spectabilis	135
walteri	**138**, 140
zelayensis	147
Echinoglochin (section of Echinospermum)	**79**
Echinolaena	469
hirta	469
inflexa	77, 469
polystachya	469
scabra	469
Echinopanax	383
Echinospermum	79
greenei	89
Edelweiss	430
Elaeagnaceae	378
Elaeagnus	378
Elderberry	412
Electra (section of Coreopsis))	642
Eleocharis	295
Elephant grass	218
Elephantella	410
Elephanthead	409
Eleusine	459
filiformis	458
indica	**459**
mucronata	458
Elrod, M. J.	252
Elymus	294
Elyonurus	510
adustus	**510**
latiflorus	510
Elytrophorus articulatus	216
Emery, Roe	253
Enchanter's nightshade	379
Engelmann spruce	275

	Page
Epilobium	379
Epipactis	316
Equisetaceae	268
Equisetum	268
Eragrostis	453
amabilis	**453**
amoena	**454**
ciliaris	**453**
delicatula	454
guianensis	**454**
maypurensis	**454**
panamensis	**454**
pilosa	**454**
plumosa	453
tephrosanthos	**454**
vahlii	454
Eremosis ovata	587
Erica	391
Ericaceae	390
Erigeron	425
irazuensis	595
maxonii	**594**
Eriochaeta	210, 211
densiflora	211
reversa	211
secundiflora	211
Eriochloa	33, 469
annulata	470
punctata	**470**
ramosa	**470**
subglabra	**470**
Eriochrysis	509
cayennensis	**509**
Eriogonum	326
Eriophorum	295
Eritrichium	79, 400
californicum	111
subglochidiatum	111, 113
choristanum	103
connatifolium	103
cooperi	105
plebeium	108
scouleri	102
Ertlebena	389
Erysimum	348
Erythronium	311
Espeletia argentea	604
phaneractis	**603**
Eucephalus	423
Euphaseolus, section	696
Euphorbia	374
Euphorbiaceae	374
Evening-primrose	382
family	378
prairie	381
Everlasting, pearly	429
Fabaceae	367
Fairybells	313
False dandelion	415
flax	346
hellebore	310
Fanweed	345
Fatsia	383
Fern, bristle	267
brittle	268
holly	267
lace	26

	Page
Fern, male	268
oak	267
parsley	265
pod	266
wood	268
Fescue	291
Festuca	291
filiformis	458
Fiddleneck	400
Figwort family	403
Filix	268
Fir	275
alpine	276
Douglas	276
red	276
Fireweed	380
Fish Lake, flora of	245
Flag, blue	314
Flax	374
false	346
family	374
wild	374
Fleabane	425
cutleaf	426
daisy	427
showy	427
white	426
Fleischmannia standleyi	590
Flor de San Francisco	613
Flourensia hirta	630
hirtissima	629
Forget-me-not	400
alpine	400
bur	399
Fountain grass	214
Foxtail	216
green	155, 282
marsh	283
yellow	155
Fragaria	362
Fringed parnassia	353
Fritillaria	314
Fumariaceae	344
Fumitory family	344
Gaillardia	432
Galeana	649
Galericularia	703
Galium	411
Gamalote	161, 163
Garden Wall	235
Garlic	311
Gaultheria	391
Gaura	382
Gaylussacia	392
Gayophytum	382
Gentian	394
blue	394
family	394
Gentiana	394
Gentianaceae	394
Geraniaceae	374
Geranium	374
family	374
Geum	363
Ghost-plant	389
Ghost's lariat	339
Giant cedar	276
reed	456
Gilia	397
Ginseng	383
family	383
Glacier lily	311
Glacier National Park, animals	236
area	235
bibliography	253
botanical exploration of	249, 251
forests	237
general features of flora	236
geology	235
hepatics	254
introduced species	237
lichens	254
life zones	238
map	239
mosses	254
number of species of plants represented	249
relationships of flora	237
Globeflower	340
Glyceria	290
Glycosma	385
Glycyrrhiza	370
Gnaphalium	430
Gochnatia boliviana	651
curviflora	652
glutinosa viscosissima	653
hypoleuca	652
obtusata	652
viscosissima	653
Golden aster	421
dock	329
Goldenrod	422
Goose grass	459
Gooseberry family	357
wild	358
Goosefoot famliy	330
Grape, Oregon	344
Grapefern	264
Graphephorum	286
Grass, barley	294
canary	282
family	280
holy	282
onion	288
porcupine	282
Seneca	282
slough	287
tickle	284
vanilla	282
Gratiola	406
Gray hedysarum	370
rockcress	351
Green alder	325
foxtail	282
spleenwort	266
Griffiths, David	252
Grindelia	421
Grossularia	358
Grossulariaceae	357
Ground juniper	277
Ground-cedar	271
Ground-pine	271

	Page
Guadua	452
angustifolia	452
glomerata	452
Guardiola tulocarpus	605
pubescens	605
Guinea grass	484
Gum-plant	421
Gutierrezia digyna	591, 592
dracunculoides	592
euthamieae	593
glomerella	592
grandis	592
lindheimeriana	592
sarothrae	593
sphaerocephala	592
Gymnolomia	619
connata	619
hirsuta	619
hondensis	619, 620
jelskii	619
kunthiana	619
rudbeckioides	619, 630
tenella	619, 620
triplinervia	619, 620
Gymnopogon	460
foliosus	460
Gymnothrix	210, 211, 214
bambusiformis	230, 232
complanata	226
crinita	225
distachya	229, 230, 232
domingensis	228
geniculata	221, 222
grisebachiana	227
mexicana	226, 227
thuarii	210
tristachya	230, 231, 232
Gynerium	456
saccharoides	456
sagittatum	456
Habenaria	316
Hairgrass	286
Halerpestes	341
Haloragidaceae	382
Harebell	414
family	414
Hare's-ear mustard	348
Harpostachys (section of Panicum)	34
Hawksbeard	417
Hawkweed	418
Hawthorn, black	366
Heal-all	402
Heath family	390
Heather, red	390
white	391
Hecubaea aptera	649
scorzoneraefolia	650
Hedge-nettle	403
Hedysarum	370
Hekaterosachne	123
elatior	123
Helianthus	431
grandiceps	621
jelskii	621
lehmannii	621
niveus	621
subniveus	621
Heliopsis	609
longipes	608
Heliotrope, wild	412
Hellebore	311
false	310
Helleborine	316
Hemieva	354
Hemlock, water	386
western	276
Hemp, Indian	395
Hepatics of Glacier Park	254
Heracleum	386
Heteranthesia	704
Heterisia	357
Heteropogon	509
contortus	510
Heuchera	355
Hibiscus	376
Hieracium	418
abscissum	658, 659
morelosanum	658
arsenei	656
bulbisetum	659
comaticeps	659
crepidispermum	657
frigidum	660
herrerae	660
irasuense	660
jaliscense	661
jalsicopolum	657
junceum	657
maxonii	660
melanochryseum	659
mexicanum	657, 660
nicolasii	657
oaxacanum	659
panamense	658
pringlei	661
prionobium	657
wrightii	658
Hierochloa	282
Highbush cranberry	412
Hilaria cenchroides	77
Himalaya grass	215
Hippagrostis	123
Hippuris	383
Hitchcock, A. S	252
Holcus	216, 509
sorghum	509
sudanensis	509
spicatus	210, 216, 217
striatus	498
Holly-fern	267
Hollyhock	376
wild	376
Holy grass	282
Holzinger, J. M	251
Homalobus	371, 372
Homalocenchrus	463
hexandrus	463
Homolepis	499
isocalycia	500
Honeysuckle family	412
Hop clover	369
Hoplismenus	123
Hordeum	294
Horehound, water	402

	Page
Horned pondweed	278
Horsemint	402
Horsetail	268
family	268
Horseweed	426
Huamanpeta	653
Huckleberry	392
Hudsonian Zone in Glacier Park	245
Hungarian grass	155
Hyacinth	308
Hydrophyllaceae	397
Hydrophyllum	398
Hymenachne	34, 499
amplexicaulis	499
auriculata	499
montana	212, 234
myuros	499
striata	498
Hymenatherum	650
Hymenostephium	619, 630
rudbeckioides	630
Hymenoxys	431
Hypericaceae	376
Hypericum	376
Hypopitys	390
Ibidium	316
Ichnanthus	1, 496
alsinoides	4
apiculatus	12
axillaris	7, 8, 497
glaber	10
ichnodes	1, 11, 12, 496
lanceolatus	8, 9
leiocarpus	10
martianus	9
mayarensis	3
mexicanus	10, 11
nemoralis	9, 10
nemorosus	5, 6, 12
pallens	1, 5, 6, 7, 8, 12, 497
panicoides	1, 496
petiolatus	9
riedelii	496
tenuis	3, 4
wrightii	3
Imperata	505
brasiliensis	505
caudata	223
caudata	506
contracta	506
Indian hemp	395
millet	218
mustard	348
paintbrush	408
warrior	410
Indian-pipe	389
family	389
Iridaceae	314
Iris	314
family	314
Isachne	115, 500
angustifolia	118, 119
arundinacea	119, 120, 121
australis	115
disperma	120, 121
dubia	121
leersioides	117
Isachne *panicea*	119
polygonoides	115, 116, 117, 500
pygmaea	117
rigens	117, 118, 119
rigidifolia	118
trachysperma	116, 500
Ischaemum	512
ciliare	512
guianense	512
schomburgkii	512
hispidum	464
secundatum	468
Isocarpha atriplicifolia	614
billbergiana	614
blepharolepis	614
cubana	613
divaricata	614
glabrata	614
oppositifolia	614
Iva	430
Ixophorus	156
glaucus	165, 217
italicus	190
verticillatus	178
viridis	187
Jack, J. G	252
Jacob's-ladder	396
Jaliscoa pappifera	587
pringlei	588
Japanese barnyard millet	133, 146
Jerusalem oak	331
Jim Hill weed	346
Jobs-tears	513
Johns Lake, flora of	245
Jones, M. E	252
Jubaria (section of Panicum)	34
Juncaceae	305
Juncoides	307
Juncus	305
Juneberry	367
Junegrass	287
Juniper, ground	277
Juniperus	277
Kalmia	390
Kentucky bluegrass	289
Kerstingiella	663
Khuskhus	508
Kinnikinnick	391
Kittentails	407
Knotweed	328
tall	329
Koeleria	287
Krynitzkia	79
californica	111
subglochidiata	93, 113
chorisiana	103
cooperi	105
lithocarya	102
mollis	86
plebeja	108
scouleri	102
trachycarpa	108
Kuhnia oreithales	591
triplinervis	591
Labrador tea	391
Lace fern	266
Laceflower	355

	Page
Lactuca	416
Lady fern	266
Lady's-tresses	316
Laestadia costaricensis	593
lechleri	593
Lakes of Glacier Park	244, 245
Lamb's-quarters	332
Lange, E. F	252
Lappula	399
Larch	275
Larix	275
Larkspur	339
Lasiacis	1, 13, 497
anomala	29, 30, 31
compacta	28
divaricata	17, 20, 21, 23
globosa	23
grisebachii	16, 17
harrisii	20
leptostachya	19, 20
liebmanniana	28
ligulata	18, 19, 25, 31, 498
oaxacensis	17, 18
patentiflora	24, 25
procerrima	13, 14, 15, 16, 498
rhizophora	19
rugelii	16
ruscifolia	28, 29, 30
sloanei	23, 24, 25
sorghoidea	25, 28, 31, 498
swartziana	26
Lasiospron, section	677
Lathyrus	373
Laurel, mountain	390
Rocky Mountain	390
Lavauxia	381
Leatherleaf saxifrage	355
Lechugilla	658
Ledum	391
Leek	311
Leersia	463
hexandra	463
Leguminosae	367
Leighia (section of Viguiera)	620
Lemnaceae	304
Leontodon	416
Lepargyrea	378
Lepidium	345
Leptarrhena	355
Leptasea	356
Leptilon	426
Leptochloa	458
domingensis	459
filiformis	458
mucronata	458
perennis	458
scabra	458
virgata	458
domingensis	459
gracilis	459
Leptocoryphium	464
lanatum	464
Leptostachya domingensis	459
filiformis	458
virgata	458
Leptosyne (subgenus of Coreopsis)	642
Leptotaenia	387
Lesquerella	346
Lettuce	416
prickly	417
Lewis, J. E	253
Lichens of Glacier Park	254
Licorice, wild	370
Liliaceae	308
Lily family	308
glacier	311
mariposa	313
Limber pine	274
Limnobotrya	357
Limnorchis	317
Limosella	406
Linaceae	374
Linanthus	397
Linaria	404
Linnaea	412
Linum	374
Lipactinia (section of Verbesina)	640, 641
Listera	315
Lithophragma	354
Lithospermum	400
glabrum	95
plebejum	108
Loasa family	378
Loasaceae	378
Locoweed	372
Lodgepole pine	274
Lonicera	413
Loranthaceae	438
Lousewort, alpine	410
Lupine	368
Lupinus	368
Lupulinaria	703
Luziola	463
spruceana	463
Lychnis	334
Lycopodiaceae	270
Lycopodium	270
Lycopus	402
Lycoseris bracteata	653
trinervis	653
Lysias	317
Lysichiton	304
Lysiella	316
Lysimachia galericulata	703
Mackenzie, K. K	253
Macrochaeta	211
sacchariformis	211
Macroptilium, section	680
Madder family	411
Madia	431
Maidenhair	265
Malaceae	366
Malacothrix floccifera	656
obtusa	656
Male fern	268
Mallow family	376
Malvaceae	376
Manisuris	510
guianensis	510
Maple	375
family	375
Mare's-tail	383

	Page
Mariposa lily	313
Marsh foxtail	283
violet	377
Marshlocks	361
Maschalostachys	704
Matricaria	432
Meadow parsnip	384
Meadow-rue	342
Meadowsweet, pink	359
white	359
Megastachya amoena	454
panamensis	454
Melampodium argophyllum	606
cinerascens	605
cinereum	606
argophyllum	606
longicornu	606
microcarpum	606
mimulifollum	607
rosei	607
Melampyrum	410
Melanthera lanceolata	629
microphylla	629
oxycarpha	**628**
purpurascens	629
Melica	288
Melilotus	370
Mentha	402
Menthaceae	401
Mentzelia	378
Menyanthaceae	395
Menyanthes	395
Menziesia	391
Mertensia	400
Micranthes	357
Microcochle, section	679
Microseris	417
Microsteris	397
Miliaria (section of Panicum)	34
Milium *colonum*	150
compressum	472
crusgalli	140
digitatum	466
nemorosum	5
punctatum	470
ramosum	470
rigidifolium	118
rigidum	118
undulatifolium	129
Milkvetch	370
Milkweed	395
family	395
Millet	155
Japanese barnyard	133, 146
pearl	165, 209, 216, 218
Mimulus	405
Minkelersia	663, **670**, 672
biflora	670, 671
galactoides	670, 671
multiflora	**671**, 672
pauciflora	**671**
vulcanica	**671**
Mint, American	402
family	401
Mistletoe family	438
Mistmalden	398
Mitella	354
Miterwort	354
Moehringia	337
Moldavica	402
Monachne subglabra	470
Monarda	402
Moneses	388
Monkeyflower	405
Monolepis	331
Monoplegma	663, 664
sphaerospermum	664
trinervium	**664**
Monotropa	389
Monotropaceae	389
Montanoa affinis	**612**
anomala	611
arsenei	**611**
frutescens	611
myriocephala	611
patens	612
pilosipalea	**612**
purpurascens	611
rekoi	**610**
subglabra	**611**
subtruncata	613
uncinata	611, 612
xanthiifolia	611
Montiastrum	333
Moonwort	263
Mormon biscuit	431
Morning-glory family	396
Mosses of Glacier Park	254
Moth mullen	404
Moulinsia	530
lanosa	566
Mountain alder	325
dock	330
laurel	390
lover	375
maple	375
rice	283
sorrel	333
timothy	283
Mountain-ash	366
Mountain-spray	359
Mouse-ear chickweed	335
Mousetail	341
Mudwort	406
Muhlenbergia	283
scabra	523
Mullen	404
Muscaria	356
Muskflower	406
Mustard	348
family	344
hare's-ear	348
Indian	348
tansy	347
tumble	347
Myosotidea (section of Eritrichium)	79
Myosotis	400
californica	111
chorisiana	103
scouleri	102
Myosurus	341
Myriophyllum	382
Nabalus	419
Naiocrene	333

	Page
Napier grass	218
Nastus	49
guadua	452
Navarretia	396
Navicularia	1
glabra	1, 10
hirta	1, 2
lanata	1, 10
Nazia	49
racemosa	48, 77
Negerhirse	209
Nemophila	398
Nepeta	403
Nettle	326
family	326
New Jersey tea	376
Nightshade, enchanter's	379
Ninebark	359
Noble, H. A	253
Nocca helianthifolia	597
media	**596**
pringlei	597
pteropoda	**597**
Norta	347
Norton, Miss G. P	252, 253
Nymphaea	338
Nymphaeaceae	338
Oak fern	267
Oats	287
Ochractinia (section of Verbesina)	639
Ochrocodon	314
Ocotillo	610
Odontelytrum	209
Oenothera	381, 382
Okra	376
Oleaster family	378
Olyra	503
arundinacea	504
caudata	**504**
cordifolia	**504**
latifolia	**504**
malmeana	505
micrantha	**504**
nana	505
paniculata	504
surinamensis	**503**
Onagraceae	378
Onion	311
grass	288
Ophioglossaceae	263
Ophrys	315
Oplismenus	34, **123**, 500
affinis	124, 125
africanas	123, 124
albus	124
angustifolius	149
brasiliensis	124
bromoides	124
burmanni	**124**, 125
burmanni	500
chondrosioides	129
colonus	150
compositus	130
cristatus	125
crusgalli	140
crus-pavonis	142, 148, 149, 501
Oplismenus *cubensis*	129
depauperatus	132
echinatus	153
frumentaceus	146
hirtellus	**129**, 130, 500
hirtiflorus	131
humboldtianus	124
muticus	125
jamaicensis	149
latifolius	131
liebmanni	131
loliaceus	132
longisetus	138
muricatus	140
parvifolius	127
polystachyus	135, 501
rariflorus	**131**, 132
repens	150
setarius	**4, 126**, 127, 128, 129
tenuis	3
thiebauti	132
velutinus	129
zelayensis	142, 147
Opulaster	359
Orchidaceae	314
Orchis family	314
Oregon grape	344
Oreobroma	333
Oreocarya	401
Orpine, red	352
Ortachne	523
floridana	524
pilosa	523, 528
retorta	523
scabra	524
Orthocarpus	409
Orthoclada	456
laxa	**456**
rariflora	456
Orthopogon	123
africanus	124
bromoides	125
burmanni	124
compositus	123
crusgalli	140
cubensis	129
hirsutus	135
hirtellum	127, 129
hispidus	138
holciformis	137
parvifolium	127, 129
setarius	127
Orthopogon (section of Panicum)	34
Oryza	463
sativa	**463**
Oryzopsis	283
Osmorrhiza	384
Oteiza	627
acuminata	627
Otopappus scaber	**636**
verbesinoides	637
Otoptera	663, 665
Owl-clover	409
Ox-eye daisy	432
Oxyrhynchus	663
Oxyria	330

Page

Oxytropis 372
Oyedaea 636
reticulata 636
Ozomelis 354
Pachistima 375
Pachylophus 381
Pachyrhizus 663
angulatus 677
Paintbrush, Indian 408
Palm grass 155
Pampas-grass 446
Panax 383
Panicastrella 49
Paniceae 209
Panicularia 290
Panicum 1, 13, 33, 34, 45, 123, 133, 155, 156, 480
africanum 124
agglutinans 31
album 124
alopecuroides 222
alopecurus 224
alsinoides 4
altissimum 492
altum 493
ambiguum 35
ambiguum 186
americanum 218
amphibolum 176
amplexicaule 499
amplifolium 203
antillarum 225
aristatum 149
arundinaceum 119
asperifolium 489
auriculatum 499
axillare 7, 497
balanites 489
bambusioides 20
barbatum 158
barbinode 484
berteronianum 170
bonplandianum 135
brachiatum 198, 200
brasiliense 494
breviaristatum 142
brizoides 34
bromoides 124, 125
burmanni 123, 124
caespitosum 483
caucasicum 36
caudatum 183, 198, 199, 200, 201, 204
cenchroides 52, 220, 221
chapmani 50
chauvinii 20
chnoodes 492
chrysites 471
ciliatissimum 38
colonum 150, 501
zonale 151
commelinaefolium 494
compactum 13, 28
compositum 123, 124, 202
compressum 165
confertum 120

Page

Panicum cordovense 12
corrugatum 191, 192
costatum 158
crus ardeae 160
cruscorvi 140
crusgalli 139, 140, 142, 147, 149
aristatum 142
hispidum 138
longiaristatum 142
mite 142, 144
muticum 144
purpureum 144
sabulicola 149
crus-pavonis 148
crus-pici 147
cubense 129
cuyabense 468
cyanescens 494
dactylon 460
dasyurum 169, 170
densispica 221
dispermum 119, 120, 121
dissitiflorum 193
distachyon 35
distans 42
divaricatum 13, 20, 21, 23, 28
var. *puberulum* 18
var. *stenostachyum* 21
dumetorum 198
echinatum 153
echinolaena 469
elephantipes 492
eligulatum 492
elongatum 159
errabundum 494
erucaeforme 34, 36, 37
exile 3
falciferum 34
fasciculatum 34
flabellatum 160
flavescens 158
flavum 169, 171
francoi 125
frondescens 485
frumentaceum 142, 146
fruticosum 18, 25
fuscescens 169
geminatum 484
geniculatum 168, 170, 171, 502
germanicum 189, 190
gibbum 498
gilesii 35
glaberrimum 10, 168, 171
glaucescens 119, 170
glaucum 165, 168, 170, 187, 216, 217
flavescens 165
purpurascens 169
glumare 34
glutinosum 493
glutinosum 25, 131
gracile 170
granulare 34
grisebachii 16
grossarium 483

	Page
Panicum *grossum*	140
guianense	487
helobium	494
helopus	34, 35
helvolum	178
hemignostum	6
hemitomon	43
hirsutum	493
hirtellum	123, 124, 127, 129, 138, 500
hispidum	138
holciforme	137
hordeiforme	211
horridum	149
ichnodes	11, 496
imberbe	168, 169, 170, 171, 502
dasyurum	170
latifolium	170
pumilum	169
purpurascens	170
impressum	176, 177, 502
incertum	150
insulare	465
intercedens	35
intermedium	176
isachne	34, 36
mexicana	36
isocalycium	500
italicum	185, 189, 190, 202
germanicum	190
viride	187
jamaicense	149
jumentorum	484
jurgensenii	160
koenigii	36
laevigatum	168, 169, 170
lanatum	13, 25, 26, 465, 498
sorghoideum	26, 28
lappaceum	124
latifolium	18, 23
laxum	487
leandri	41
leiocarpon	10
leucophaeum	465
liebmannianum	28
lindeni	8
loliaceum	2, 131
longisetum	138
lutescens	165
luticola	485
macrostachyum	202, 203, 204
macrourum	202
maculatum	31
magnum	489
martianum	9
martinicense	13, 16, 26
maximum	484
mayarense	3
megacarpum	28
megiston	492
mexicanum	163
micranthum	493
miliiforme	35
milleflorum	489
millegrana	491
molle	484
multinerve	120

	Page
Panicum *muricatum*	140, 153
myosurus	499
myuros	499
nemorale	9
nervosum	494
nuttallianum	127
oaxacense	17
obtusum	43
occidentale	171
olyroides	492
onurus	177, 204
orinocense	25
oryzoides	491
pallens	6, 497
palmaefolium	161
palmifolium	155, 161
paniculiferum	163
paractaenoides	198, 199
parciflorum	131
parvifolium	494
paspalodes	485
penicillatum	169, 170, 171
petiolatum	9
phyllanthum	135
pilcomayense	493
pilisparsum	489
pilosissimum	492
pilosum	489
plantagineum	34, 41, 42
platyphyllum	40
plicatum	156, 161
haitiense	161
poiretianum	159
polycomum	493
polygamum	484
polygonatum	487
polygonoides	116, 500
polyphyllum	34, 35
polystachion	222
polystachyum	207
praegnans	18, 25
procerrimum	15, 498
prorepens	150
prostratum	483
psilocaulon	170
pubinode	36
pumilum	168, 169
punctatum	34
pungens	140
purpurascens	169, 170
pyramidale	134
raddianum	125
rariflorum	193, 456
reptans	43, 483
restitutum	198
reversum	35
rhizophorum	19
riedelii	496
rigens	118
rigidifolium	118
rudgei	492
rugelii	16
rugulosum	491
ruscifolium	28
sabulicola	501
sabulicolum	48, 149

Page

Panicum *sanctae-marthae* 125
sanguinalis 466
scandens 181
longiseta 181
vulgare 181
scheelei 207
schlechtendahlii 12
var. *monstrosum* 12
schultesii 125
scindens 144
setarium 126
setosum 198, 199, 204
sloanei 13, 23
sorghoideum 25, 26, 498
speciosum 160
spectabile 135, 501
guadaloupense 134
sphaerocarpon 176
sphaerocarpum 176, 177
stenodes 491
stoloniferum 485
streptostachys 489
striatum 498
subsphaerocarpum 203
sulcatum 159, 160, 162, 163
swartzianum 26
tejucense 169
tenacissimum 182
tenax 176, 502
tenue 3
tenuiculme 487
trachyspermum 116
trichoides 485
trinii 182
triticoides 221
uncinatum 469
undulatifolium 129
velutinosum 484
velutinum 129
ventenatii 169
versicolor 171
verticillatum 178, 179
ambiguum 186
parviflorum 179
viaticum 158
villosum 35
virescens 170
viride 156, 165, 178, 179, 187
brevisetum 187
vulpisetum 202, 203, 222
walteri 138
wightianum 36
wightii 36
zelayense 147
zizanioides 491
zonale 150
Papaver 344
Papaveraceae 344
Pará grass 484
Paratheria 50, 209
Pariana 457
gleasoni 513
radiciflora 457
zingiberina 458
Parnassia 353
family 353
Parnassiaceae 353

Page

Parsley family 383
fern 265
Parsnip 386
cow 386
meadow 384
water 385
Parthenium densipilum 607
fruticosum 608
hysterophorus 607
parviceps 607
Paspalum 33, 474
abrahami 480
appressum 484
arenarium 479
attenuatum 471
capillare 471
carinatum 475
chinense 468
compressum 472
conjugatum 476
coryphaeum 480
decumbens 34, 477
densum 479
distichum 476
vaginatum 476
exasperatum 471
fimbriatum 475
fluitans 475
gracile 475
lanatum 464
leptostachyum 471
longiflorum 468
melanospermum 478
millegrana 479
minutiflorum 468
multicaule 476
nutans 477
olivaceum 478
orbiculatum 478
potarense 478
paniculatum 497
papillosum 476
pectinatum 475
pedunculatum 477
platicaulon 472
parviflorum 474
platyphyllum 40
pulchellum 477
pumilum 477
pusillum 478
repens 475
scoparium 471
serpentinum 477
vaginatum 476
virgatum 479
Pasque-flower 343
Pastinaca 386
Pathfinder 430
Paurochaetium (subgenus of Panicum) 50, 155
Payne, W. W 253
Pea, yellow 369
Peachleaf willow 320
Pear 366
Pearl millet 165, 209, 216, 218
Pearlwort 336
Pearly everlasting 429
Pectianthia 354

Page

Pedicularis 409
Pellaea 266
Pemmican 367
Penicillaria 209, 210
ciliata 210
plukeneti 217
spicata 165, 210, 216, 217
Pennisetum 34, 50, 76, 209, 210, 211, 212, 502
alopecuroides 221
alopecuros 224
americanum 165, 209, 218
antillarum 210, 225
bambusiforme 232, 233
breve 224
cenchroides 210, 215, 216
ciliare 212, 215, 216
complanatum 226, 227
compressum 222
corrugatum 191, 234
crinitum 225, 226, 228, 229
crusgalli 234
dasistachyum 221
distachyum 229, 230, 231, 232
domingense 228
durum 212, 228, 229
erubescens 221
exaltatum 210, 212
flavescens 221
geniculatum 168, 234
germanicum 234
glaucum 77, 165, 209, 210, 212, 216, 217, 218
gymnothrix 218
hamiltonii 222
hirsutum 221
holcoides 216
hordeiforme 211
humboldtianum 225
indicum 209, 210, 222
var. *purpurascens* 222
var. *typica* 222
italicum 190, 234
karwinskyi 210, 212, 219, 220
laevigatum 169, 234
latifolium 231
longistylum 214
macrophyllum atropurpureum 214
macrostachyum 209, 211, 214
mexicanum 227
mollissimum 218
montanum 234
multiflorum 209, 219, 220
mutilatum 77, 210, 212
myosuroides 52, 234
nervosum 77
nicaraguense 222
orientale 210
triflorum 214, 215
pallidum 221
pentastachyum 211
perottetii 218
polystachyum 209, 222
pringlei 229
prolificum 230, 231, 232, 233
pungens 52, 234
purpurascens 221, 222
purpureum 209, 218

Page

Pennisetum *richardi* 221
ruppelii 209, 214
scandens 180, 234
setosum 77, 199, 209, 210, 220, 221, 222, 223, 224, 225, 502
sieberi 221
spicatum 217
swartzii 199
triflorum 214
tristachyum 77, 230, 231, 232
var. *bambusiforme* 232
var. *galeottianum* 232, 233
triticoides 221
typhoideum 165, 210
uniflorum 221
versicolor 218
verticillatum 178, 187, 234
villosum 77, 213, 214
var. *humile* 213
violaceum 210, 218
viride 187, 234
Pentastachya 211
abyssinica 211
Pentstemon 404
Peppergrass 345
Peramium 316
Perezia wislizeni 653
megacephala 653
minor 653
Perilomia cordifolia 716
fruticosa 719
Peritoma 352
Persicaria 328
Perymenium acuminatum 627
asperifolium 626
blepharolepis 626
cervantesii 622
chihuahuense 625
consobrinum 626
cornutum 623
flexuosum 622
goldmanii 624
gracile 623
hypoleucum 626
jaliscense 622
lancifolium 623
lasiolepis 625
latisquamum 626
nicaraguense 624
oxycarphum 622
parvifolium 625
purpusii 624
rotundisquamum 623
ruacophilum 627
rude 625
simulans 621
strigillosum 627
subcordatum 622
tenellum 622
Petasites 434
Phaca 372
Phacelia 398
Phalaris 282
zizanioides 508
Pharus 463
latifolius 464

Page

Phaseolus 663, 672, 673
acutifolius 693
tenuifolius 693
adenanthus 700
latifolius 700
radicans 701
affinis 682
amplus 675
angustissimus 687
latus 687
anisotrichos 700
incisus 700
antillanus 674
appendiculatus 675, 676
asper 701
atropurpureus 680, 681, 682
ecuadoriensis 682
sericeus 681
aureus 682
balansae 678
bertonii 677
bilobatus 680
bolivianus 694
brevicalyx 695
buseri 670
campestris 678
candidus 675
canescens 680
caracalla 677
caracallensis 677
chiriquinus 700
clitorioides 675
coccineus 685
cochleatus 676, 699
coriaceus 701
cuernavacanus 700
dilatatus 687
dysophyllus 680, 681
elegans 674
elongatus 701
esperanzae 692
falciformis 693
filiformis 687
firmulus 674
flavescens 686
floribundus 690, 692
foliaceus 689
formosus 684
fraternus 679
fulvus 700
glabellus 683
glaber 683
gracilis 680
grandiflorus 677
grayanus 687, 692
griseus 683
halophilus 675
hernandezii 682
heterophyllus 680, 695
rotundifolius 680
hirsutus 678
intonsus 696
jaliscanus 697
juruanus 678
lanceolatus 679
lasiocarpus 678
balansae 678
igatimianus 678

Page

Phaseolus latidenticulatus 674
latifolius 693, 700
laxiflorus 692
leiosepalus 685
leiospermus 668
leptostachyus 700
leucanthus 686
ligulatus 676
linearis 677, 701
coriaceus 701
latifolius 701
violaceus 677
lobatus 677
longepedunculatus 680, 681, 682
longifolius 678
longirostratus 677
lozanii 669
lunatus 694, 698, 699
macrolepis 698
macropoides 680
macropus 680
maculatus 688
maritimus 675
megatylus 675
membranaceus 675
maritimus 675
metcalfei 687, 688
micranthus Hook. & Arn. 695
micranthus Mart. & Gal. 680, 695
microcarpus 701
mollis 693
monophyllus 680
rufus 680
monospermus 701
multiflorus 685
mungo 682
oaxacanus 691
obliquifolius 674
oblongifolius 675
obvallatus 684
occidentalis 700
oligospermus 698
opacus 695
ovatifolius 688
ovatus 678
glabratus 679
pachyrhizoides 700
palmeri 691
parviflorus 680
parvulus 672
pauciflorus 668
pedatus 679
pedicellatus 684, 688, 691
peduncularis 674, 675
clitorioides 675
pilosus 678, 696
pius 674
polyanthus 685
polymorphus 691
proriferus 684
pulchellus 674
purpusi 691
refusus 688
revolutus 697
rigidus 699
robustus 676
rosei 694
rotundifolius 680

	Page
Phaseolus rubidus	680
rufus	680
salicifolius	692
savannarum	680
scabrellus	691
schaffneri	690
schiedeanus	680
schottii	678
campestris	678
scolecocarpus	681
semierectus atropurpureus	681
sempervirens	697
speciosus	674
spiralis	699
strigillosus	685
sylvestris	684
tenellus	696
tenuifolius	693
trichocarpus	679
truxillensis velutinus	700
tuerckheimii	700
venosus	687
vestitus	681, 693
vignoides	676
violaceus	677, 701
viridis	693
vulgaris	698
xanthotrichus	698
wrightii	687
Phegopteris	267
Philactis	608
longipes	608
zinnioides	608
Phleum	283
Phlox	397
family	396
Phyllodoce	390
Physaria	346
Physocarpus	359
Physostigma	663
Picea	275
Pigeon grass	155
Pigweed	332
family	332
Pin cherry	367
Pinaceae	273
Pinaropappus *caespitosus*	656
parvus	655
spathulatus	656
Pincushion plant	396
Pine	273
family	273
limber	274
lodgepole	274
western white	274
western yellow	273
whitebark	274
Pineapple-weed	432
Pinedrops	390
Pinesap	390
Pinguicula	410
Pinguiculaceae	410
Pink aster	423
carpet	334
corydalis	344

	Page
Pink dogbane	395
family	333
meadowsweet	359
pyrola	389
Pinus	273
Piperia	317
Pipsissewa	388
Plagiosetum	209
Plantaginaceae	411
Plantago	411
Plantain	411
family	411
Plectrotropis	663
Plum	367
Poa	288, 453
amabilis	453
ciliaris	453
maypurensis	454
pilosa	454
plumosa	453
vahlii	454
Poaceae	280
Pod fern	266
Poison camas	310
Polemoniaceae	396
Polemonium	396
Polygonaceae	326
Polygonum	327
Polymnia apus	604
edulis	604
microcephala	605
parviceps	604
Polypodiaceae	264
Polypodium	265
Polypody family	264
western	265
Polypogon monspeliensis	179
Polystichum	267
Pondlily, yellow	338
Pondweed	278
family	278
horned	278
Poplar, western balsam	318
Poppy	344
family	344
Populus	317
Porcupine grass	282
Portulacaceae	332
Potamogeton	278
Potamogetonaceae	278
Potentilla	359
Poverty-weed	331
Prairie gentian	394
Prenanthes	419
Prickly lettuce	417
Primrose family	393
Primulaceae	393
Proustia baccharoides	653
cuneata	653
Prune	367
Prunella	402
Prunus	367
Pseudechinolaena	469
polystachya	469
Pseudotsuga	276
Psophocarpus	663

	Page
Pteridium	265
Pterospora	390
Ptilocalais	417
Ptychophyllum (subgenus of Chaetochloa)	155, 156, 158
Ptychophyllum (subgenus of Panicum)	156, 160
Puccinellia	290
Puccoon	400
Pulsatilla	343
Purple avens	363
clematis	339
geranium	374
hedysarum	370
onion	311
rockcress	351
saxifrage	356
violet	377
Purpureae	531
Purslane family	332
speedwell	407
Pussytoes	427
Pyrola	388
family	388
Pyrolaceae	388
Pyrrocoma	422
Quaking aspen	318
Quamasia	312
Queencup	312
Quince	366
Raddia	505
malmeana	505
nana	505
Radicula	346
Ragweed	430
Ragwort	436
Ramirezella	663, 665, 669
buseri	670
glabrata	670
lozanii	669
nitida	669
occidentalis	670
ornata	670
pringlei	670
pubescens	670
strobilophora	670
Ramischia	389
Ranunculaceae	338
Ranunculus	341
Raram	49
Raspberry, black	365
red	364
Rattle, yellow	410
Rattlesnake plantain	316
Rattlesnake root	419
Razoumofskya	438
Red cedar	277
clover	369
fir	276
heather	390
monkeyflower	406
orpine	352
raspberry	364
twinberry	413
Red-osier dogwood	387
Redstem saxifrage	357
Reedgrass	284, 285
Reimaria laxa	465
Resurrection plant	272
Rhamnaceae	375
Rhamnus	376
Rhinanthus	410
Rhodiola	352
Rhubarb, sacred	386
Ribes	357
Rice	463
Rice, mountain	283
Rock slides, flora of	248
Rockcress	350
gray	351
purple	351
Rocky Mountain beeplant	352
laurel	390
Romanzoffia	398
Rosa	365
Rosaceae	358
Rose	365
family	358
Rubacer	364
Rubiaceae	411
Rubus	364
Rumex	329
Rumfordia oreopola	609
verapazensis	609
Running-pine	271
Rush	305
family	305
toad	306
Russian thistle	331
Rye	280
Rye, wild	294
Rytilix granularis	77
Sabazia anomala	615
leiachaenia	614
radicans	615, 616
sarmentosa	615, 616
triangularis	615
Sabina	277
Saccharum *antillarum*	225
contractum	506
officinarum	506
sagittatum	456
Sacciolepis	498
myuros	499
striata	498
Sacred rhubard	386
Sagebrush	433
Sageleaf willow	322
Sagina	336
Sagittaria	279
St. Augustine grass	469
St. John's-wort	376
family	376
Salicaceae	317
Salicornia	49
Salix	319
amygdaloides	320
anglorum	322
barrattiana	321
bebbiana	323
brachycarpa	322
candida	322
cascadensis	324
caudata	320
commutata	321

	Page
Salix drummondiana	323
exigua	321
farrae	321
geyeriana	323
glauca	322
glaucops	322
interior	320
longifolia	321
mackenziana	321
melanopsis	321
nivalis	324
petrophila	322
pseudolapponum	322
pseudomonticola	321
pseudomyrsinites	321
saximontana	324
scouleriana	323
serissima	320
stricta	322
subcoerulea	323
tenera	324
vestita	324
Salsola	331
Saltgrass	288
Sambucus	412
Sandalwood family	326
Sandbar willow	320
Sandbur	503
Sandwort	337
Sanicula	384
Santalaceae	326
Sarsaparilla, wild	383
Saubinetia (section of Verbesina)	638, 639
Savastana	282
Saxifraga	355
Saxifragaceae	353
Saxifrage	355
family	353
leatherleaf	355
purple	356
redstem	357
Schaffner, J. H	253
Scheuchzeria	279
family	279
Scheuchzeriaceae	279
Schistachne	518
Scirpus	295
Sclerocarpus columbianus	609
phyllocephalus	610
Scouring-rush	268
Scrophulariaceae	403
Scrub birch	324
Scutellaria affinis	741
alta	724
altamaha	744
ambigua	729
angustifolia	725
austinae	726
canescens	726
antirrhinoides	731
californica	713
sanhedrensis	732
apiciflora	737
arenicola	740
arguta	733
Scutellaria aurea	711
conzattii	712
austinae	726
bolanderi	712
californica	713
brevifolia	745
brittonii	727
virgulata	728
bushii	725
californica	713
campestris	729
canescens	743
punctata	743
cardiophylla	721, 730, 748
caroliniana Lam	746
caroliniana Walt	734
chalicophila	741
chamaedryas	733
churchilliana	719
coerulea	722
cordifolia	734
minor	735
pilosissima	735
costaricana	715
cubensis	736
cuneata	741
deltoidea	747
distans	722
drummondii	730
dumetorum	722
elliptica	741
epilobifolia	723
felisberti	738
floridana	745
footeana	712
formosa	718
galericulata	723, 724
albiflora	723
rosea	723
gaumeri	742
glabra	715
glabriuscula	745
gracilis	721
guatemalensis	715
guilielmi	712
hastata	747
havanensis	736
portoricensis	737
helleri	730
hirsuta	741
hispidula	728
hyssopifolia	746
incana	743
punctata	743
integrifolia	746
brevifolia	745
hispida	747
hyssopifolia	746
major	746
multiglandulosa	747
isocheila	718
laevigata	742
lateriflora	720
rhodantha	720
linearifolia	726

Scutellaria *longiflora* 736
longifolia 717
lutea 710
maxonii 718
mellichampii 744
microphylla 723
mississippiana 734
mociniana 719
montana 740
multiflora 748
multiglandulosa 747
nana 712
nervosa 721
nevadensis 731
oaxacana 737
ocmulgee 737
orichalcea 711
ornata 717
ovalifolia 741
ovata 734
bracteata 735
pilosior 735
parviflora 721
parvula 729
ambigua 729
mollis 729
pauciflora 723
pedicularis 711
pilosa Hill 734
pilosa Michx 741
hirsuta 741
pilosiuscula 724
polymorpha 746
potosina 730
pseudo-coerulea 739
pubescens 743
punctata 743
purpurascens 738
heterophylla 738
racemosa 720
radicata 748
resinosa 730
rosei 713
rugosa 735
rumicifolia 720
sanhedrensis 732
saxatilis 733
arguta 733
pilosior 735
saxicola 714
scarlatina 716
seleriana 714
serrata 742
siphocampyloides 726
spinescens 710
splendens 716
suffrutescens 710
teucrifolia 721
tuberosa 724
venosa 735
ventenatii 716
veronicifolia 725
versicolor 734
bracteata 735
minor 735
viarum 731
Scutellaria villosa Ell 743
villosa Raf 748
virgulata 728
vitifolia 739
wrightii 730
Sedge 296
family 294
Sedum 352
Selaginella 271
family 271
Selaginellaceae 271
Self-heal 402
Selleophytum 641
buchii 641
Seneca grass 282
Senecio 436
flocciferus 656
Serapias 316
Sericotheca 359
Sericura 211
elegans 211
Serviceberry 366
Setaria 501
Setaria, Ach., note on 208
affinis 169
alopecurus 202
ambigua 186
antillarum 225
berteroniana 169, 170
biconvexa 176, 502
brachiata 198, 199
caespitosa 177
californica 190
caudata 198
cenchroides 221
composita 195, 202, 203
corrugata 169, 191, 192
crus ardeae 160
effusa 163
elongata 198
falcifolia 208
flava 169, 222
geniculata 168, 221, 222
glauca 155, 165, 168, 216, 217
geniculata 171
imberbis 170
laevigata 170
penicillata 170
perennis 170
purpurascens 171
gracilis 168, 170, 171
dasyurum 170
latifolia 170
purpurascens 170
hispida 192
imberbis 169
impressa 160
italica 155, 197
jurgensenii 160
laevigata 169
laevis 183
latifolia 194
liebmanni 193
longipila 191
macrosperma 195
macrostachya 203, 204, 205

	Page
Setaria *magna*	185
mexicana	183
onurus	177, 502
palmifolia	161
panicea	178, 179
paniculifera	163
paraclarnoides	199
penicillata	169, 171
perennis	170, 171
poiretiana	160
polystachya	202, 207
pseudoverticillata	178
purpurascens	168, 171, 502
rariflora	193, 200, 201
scandens	180
setosa	183, 198
caudata	183, 199
sphaerocarpa	177
streptobotrys	170, 171
sulcata	163
tejucensis	169
tenacissima	182
tenax	176
vaginata	200
ventenatii	168, 169, 170, 171
verticillata	178, 179
ambigua	186
villosissima	197
viridis	156, 168, 179, 187
breviseta	187
weinmanni	187
vulpiseta	202
weinmanni	187
Shadbush	367
Sheep grass	469
Sheep sorrel	330
Shepherdia	378
Shepherd's-purse	346
Shieldfern, crested	268
Showy fleabane	427
Sibbaldia	362
Sieversia	363
Sigmoidotropis, section	674
Silenaceae	333
Silene	334
Silverberry	378
Silver-plant	327
Silverweed	361
Simsia sanguinea	630
albida	630
palmeri	630
Sinapis	348
Sisymbrium	347
Sisyrinchium	314
Sium	385
Skullcap	704
Skunkberry	413
Skunkcabbage	304
Skunk-plant	396
Slough grass	287
Smartweed, water	328
Smelowskia	346
Smilacina	312
Smilax	383
Snakeroot, bur	384
Snowberry	413
Snowbrush	376
Solidago	422
Solomon's-seal, false	312
Somes, M. P	252
Sonchus	417
Sophia	347
Sorbus	366
Sorghum	509
Sorgo	509
Sorrel, mountain	330
Sour dock	330
Sourgrass	476
Sow thistle	417
Sparganiaceae	277
Sparganium	277
Spartina	460
brasiliensis	460
Spathionema	663
Spathyema	304
Spatularia	357
Speedwell	407
Sphaeralcea	376
Sphagnum bogs of Glacier Park	245
Sphenostylis	663, 665
Spikerush	295
Spiny currant	357
Spiraea	359
Spiranthes	316
Spleenwort, green	266
Sporobolus	461
aeneus	462
ciliatus	462
cubensis	462
indicus	462
jacquemontii	462
virginicus	462
Spotted pyrola	389
Springbeauty	333
Spruce	275
Douglas	276
Spurge, creeping	374
family	374
Squawgrass	309
Squirreltail	294
Stachymacris	703
Stachys	403
Standley, P. C., field work in Glacier Park	249
Starwort, water	375
Steiractinia longipes	628
mollis	628
ocanensis	628
oyedaeoides	628
rusbyana	627
Stellaria	335
Stenanthella	309
Stenanthium	309
Stenotaphrum	468
americanum	468
glabrum americanum	468
secundatum	468
Stevia flourensioides	589
integra	589
pelophila	589
tephrophylla	590
vernicosa	589
Stickleaf	378
Stickseed	400

	Page
Sticky currant	357
Stipa	282
filifolia	553
Stipagrostis, section of Aristida	518
Stonecrop	352
family	352
yellow	353
Strawberry	362
blite	332
Streptachne	518, 523
cubenis	523
floridana	524
pilosa	528
scabra	523, 528
Streptopus	313
Streptostachis asperifolia	489
hirsuta	489
Strobus	274
Strophostyles	663, 668, 682
helvola	668
leiosperma	668
pauciflora	668
Suaeda	331
Sudan grass	509
Sugar cane	506
Suksdorfia	355
Sulphur-plant	327
Sundew family	352
Sunflower	431
Svida	387
Sweet cicely	384
coltsfoot	434
Sweetclover, yellow	370
Sweetgrass	282
Sweet-scented bedstraw	411
Symphoricarpos	413
Syntherisma	1, 34, 465
chinensis	468
cuyabensis	468
digitata	466
helleri	468
longiflora	468
malacophylla	466
sanguinalis	466
Synthyris	407
Tagetes crassiceps	651
Tamarack	275
Tansy mustard	347
Taraxacum	416
Taraxia	381
Tarweed	431
Taxaceae	272
Taxus	272
Tetrachyron (section of Calea)	647
Thalictrum	342
Thelyperis	267
Thermopsis	369
Thimbleberry	364
Thistle	438
Russian	331
Thlaspi	345
Thompson, Mrs. Otto	252
Thrasya	34
Thuja	276
Thyme-leaf speedwell	407
Thymophylla	650
Thysanolaena acarifera	446
agrostis	446
Tiarella	355
Tickle grass	284
Tiger grass	446
Timothy	283
Tium	371, 372
Toad rush	306
Toadflax, bastard	326
Tofieldia	310
Toque, la	704
Torresia	282
Townsendia	423
Taxicoscordion	310
Trachypogon	510
plumosus	510
polymorphus plumosus	510
Transition Zone in Glacier Park	239
Trichachne insularis	465
recalva	465
Trichocoryne	648
connata	649
Tricholaena insularis	465
Tridax oligodonta	648
stuebelii	648
Trifolium	369
Trillium	314
Triodia	457
flaccida	457
Tripsacum	513
latifolium	513
Trisetum	286
Triticum	293
Trixidium (section of Chibadium)	598
Trixis adenolepis	654
angustifolia	654
bowmanii	655
frutescens	655
gigas	655
glaziovii	655
grandis	655
haenkei	654
peninsularis	654
radialis	655
rugulosa	655
verbascifolia	655
Trixostis	530
gracilis	539
Trollius	340
Troximon	415
Tsuga	276
Tumble mustard	347
Tumbleweed	331, 332
Turritis	352
Twayblade	315
Twinberry	413
Twinflower	412
Twisted-stalk	313
Typha	277
Typhaceae	277
Ulke, Titus	252
Umbach, L. M	251
Umbelliferae	383
Umbrella-plant	327
Uniseta, section of Aristida	518, 523
Uralepis flaccida	457
Urochloa panicoides	34
Urtica	326
Urticaceae	326
Utricularia	410

	Page
Uva grass	456
Vacciniaceae	392
Vaccinium	292
Vagnera	312
Valerian	413
family	413
Valerianaceae	413
Valota	34, 464
insularis	465
laxa	465
Vanilla grass	282
Vara prieta	605
Venus'-slipper	316
Veratrum	310
Verbascum	404
Verbena	401
Verbenaceae	401
Verbesina acuminata	639
angustifolia	639
arborea	640, 641
baccharidea	641
crassiramea	640
cymbipalea	638
guianensis	641
laevis	639
nelsonii	638
otophylla	638
oxylepis	637
pennellii	640
persicaefolia	638
schomburgkii	641
seemannii	639
stricta	637
synethes	639
synotis	637
szyszylowiczii	639
Vernonia durangensis	587
gleasoni	587
gleasonii	587
oppositifolia	587
ovata	587
stellata	587
Veronica	407
Vervain	401
Vetch	373
Vetchling	373
Vetiveria arundinacea	508
Viburnum	412
Vicia	373
Vigna	663, 665
aristata	665
lonchophylla	665
myrtifolia	666
populnea	666
strobilophora	670
strophiolata	666
Viguiera apiculata	620
Vilfa aenea	462
Viola	377
Violaceae	377
Violet	377
dog-tooth	311
Voandezia	663
Vreeland, F. K	252
Wahlbergella	334
Wake-robin	314
Wallflower, wild	348
Water birch	325
buttercup	341
hemlock	386
horehound	402
milfoil family	382
parsnip	385
smartweed	328
starwort	375
family	375
Waterleaf	398
family	397
Waterlily family	338
Waterplantain	279
family	279
Wedelia helianthoides	617
heterophylla	617
latifolia	617
oxylepis	616
symmetrica	617
Weller, Stuart	252
Werneria articulata	651
brachypappa	651
brachypappus	651
cochlearis	651
denticulata	651
lehmannii	651
pygmaea	651
Wheat	293
Wheatgrass	293
White angelica	387
campion	334
clematis	339
clover	369
dryad	363
fleabane	426
geranium	374
hawkweed	418
heather	391
meadowsweet	359
phacelia	398
pine	274
spruce	275
thistle	438
Whitebark pine	274
Whitlowgrass	349
Whortleberry	392, 393
Wild buckwheat	328
candytuft	346
flax	374
gooseberry	358
heliotrope	412
hollyhock	376
licorice	370
rye	294
sarsaparilla	383
wallflower	348
Williams, R. S	251
Willow	319
family	317
peachleaf	320
sageleaf	322
sandbar	320
Wintercress	348
Wintergreen	388, 391
creeping	391
Wokas	338

	Page
Wood fern	268
Woodland star	354
Wood-nymph	388
Woodrush	307
Woodsia	268
Wormwood	432
Wulffia *sodiroi*	597
Xerophyllum	309
Xylophacos	372
Xylosteon	413
Yagazeche	610
Yampa	385
Yarita	605
Yarrow	432
Yellow angelica	387
avens	363
beardtongue	405
bladderwort	410
columbine	340
corydalis	344
dock	329
dryad	363
hedysarum	370
monkeyflower	406
pea	369
pine	273
pondlily	338
rattle	410
stonecrop	353
sweetclover	370
violet	377
Yellow-bell	314
Yellowcress	346
Yew family	272
western	272
Youngia	417, 418
Zaluzania	626
Zannichellia	278
Zexmenia	636
aggregata	634
aurea	631
brevifolia	636
ceanothifolia	632, 633, 634
cordifolia	633
costaricensis	635
elegans	634
fasciculata	632
frutescens	635
fruticosa	632
gnaphalioides	636
gradata	632
macropoda	634
media	630
michoacana	631
oxyedaeoides	636
rotundata	632
subsericea	635
Zinnia	642
bicolor	608
leucoglossa	608
Zizia	384
Zygadenus	310